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**GEOMORPHOLOGICAL RISKS IN OIL AND GAS SPHERE**

**(оn the example of Western Kazakhstan)**

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Natural resources and organizers should take into account the geomorphological risks that are manifested in adverse and dangerous phenomena. The source of the occurrence of such processes is the human himself, who creates new irregularities on the earth's surface, which perform not natural, but economic, technological or cultural functions. Artificially created, they become an integral part of cultural or man-made landscapes, forming anthropogenic landforms. Moreover, they form their own microclimate of the territory, change the runoff of surface and groundwater. They arise at a certain time, function, and then are destroyed in a natural way or replaced by a person with others. One of such regions where it becomes necessary to consider the ecological and geomorphological state of the territory, determine the ecological functions of human habitats, and study its behavior based on risk assessment associated with nature use of a certain type is Western Kazakhstan.

Rest of the western Kazakhstan, where the relief is at risk, is the area of ​​the main oilfields in the region of the Caspian lowland, which is a marine accumulative plain. The surface of the plain is inclined towards the Caspian Sea, the absolute heights vary from 80-50 m along the periphery to 28 m below the level of the World Ocean off the coast of the Caspian. Numerous wells, oil and gas pipelines, roads and other enterprises of the oil and gas industry transform the relief as a whole, creating artificial forms.

In the studied region, 90% of hydrocarbon deposits (206 out of 230 republican) from the explored are concentrated, and 98.2% of them are at different stages of operation. The most famous Caspian oil and gas region includes a number of large fields. These include over 130 deposits, such as Tengiz, Karashyganak, Kenbai, Dossoxr, Kulsary, and others [1]. The largest fields of Mangistau region are Karazhanbas, Kalamkas, Ozen, Zhetybai, Tenge, which have significant reserves of oil and gas condens.

 Based on the analysis of the territory, we can distinguish next anthropogenic relief types: mining, linear road, construction, hydrotechnical. Such a distinguishing of relief types made according to the prevailing territorial and technological complexes that determine the nature of the anthropogenic load on the environment [2].

The mining relief is widespread around numerous deposits of oil and gas and mineral raw materials (brick clays, loams, kira and bitumen). The result of mining and oil and gas production, various forms of anthropogenic relief forms: dams, subsidence funnels, quarries, dumps, sites, embankments — access roads. A typical example of this type of relief is fencing dams 3-3.5 m high around the Tazhigali and Karaarna deposits in the west and north-west, Karazhanbas, Kalamkas.

As a result of intensive oil and gas production, a significant amount of associated formation water is extracted along with it, which is not compensated by their 100% back injection into the formation, resulting in a drop in reservoir pressure and the surface settles on the surface around the deposits and subsidence occurs. . These new forms of anthropogenic-related relief appear around oil and gas fields. Given that most of the oil fields are located within the sea plain, composed of clay, loamy and sandy fractions, subsidence processes are widely developed here. The manifestation of subsidence widely developed in the area of ​​the old Dossor and Makat oil fields, where the amplitude of subsidence is 1.5-2.5 meters [3].

The process of subsidence of the surface and the formation of subsidence in the described area will develop further, because oil and gas will extract from old and newly developed fields more than one year. New areas will develop, the territory of the region will be done by Quaternary and modern scurf, which are susceptible and will retain the ability to subsidence deformations. Cause if these, it is now necessary to establish a control system and monitor the development of this process and take protective measures to prevent or deter them, because the occurrence of subsidence over time makes them especially dangerous for hydraulic, industrial, residential and road facilities. Area, especially located along the coasts of the sea.

Because of field development, building a lot of access roads or roads between fields and individual objects are constructed in the form of earthen embankments. The average width of which is from 4 to 6 m, the height is 2 m, and the length depending on the terrain conditions is from 100 m to 7 km (Koshkar field - highway). The same landforms are in the Makat, Sagyz, Terenozek, Prorva, Tengiz, Karazhanbas, Kalamkas, Karashyganak, and other oil fields. In addition, various sizes of sites constructed around the fields with concrete or asphalt coatings to house wagon houses, storage rooms, parking lots and do on. At the Tengiz and Karaarna fields, such sites are significant (300 m long and 200 m wide). Near the places of oil production, there are small dumps of clay and sand, 1.5 m high.

Thus, the relief around the deposits are completely different by techno genic processes and, for the most part, is newly formed relief forms, areas of techno genic degradation.

The linear-road type of relief includes oil and gas pipelines, railways and roads, including country, field and ground, various water conduits, power lines and other linear and technical structures. As a result of linear road construction, in order to flatten the longitudinal profile of modern automobile and railway routes, roadside excavations are created, which are often joined with embankments, ditches and are found everywhere throughout the region. They are more developed along major highways: Uralsk –Atyrau; Uralsk-Karashyganak; Atyrau-Dossor-Sagyz-Kulsary-Tengiz and railways: Uralsk-Aksai; Atyrau-Makat-Beineu, where their length is hundreds of meters and a depth of 6-10 meters, they are less developed along country and dirt roads. On both sides of the Kulsary-Karaton highway, spring water accumulated in the recesses, giving them the character of shallow reservoirs for some time.

Another form of relief is artificially created sandy dams around the village of Karaton. The dams are not big; their height is 2-2.5 m. south of the village, along the routes of roads and oil pipelines, there are scours with a depth of 0.5-0.7 m and a length of 3 to 6 m with traces of salinization. The same scourges are found along the southern highway of the village. Kulsary, Munayly, Makat, Dossor and others. If do not take into account appropriate protective measures, they can turn into ravines. The most characteristic form of relief of this type are artificially created straightened rectilinear sections - roads: country, dirt and highway, differing not only in size but also in function. Country roads have a small width of 1-2 m and are ubiquitous. The most widely developed dirt roads that connect various settlements, oil fields and other economic facilities. They done mainly from local sandy soil and reach a width of up to 5 m. An important linear artery is asphalted highway roads that connect the largest settlements and industrial facilities with cities and neighboring areas. The width of such a road reaches 6–7 m, their height is from 1–1.5 to 2–3 m (along the sory territory of the North Bozash field). So, as a result of the interaction of the linear-road relief everywhere along the roads of highways, oil and gas pipelines, the formation of technogenic soils takes place.

The formation of the building type of relief is characterized by the creation of various relief forms within residential and industrial buildings located in the areas of oil production (especially there are a lot of them in the central part) and the territories adjacent to them. These are various embankments, dumps, quarries, landfills, leveled sites, which, which have different sizes. A typical relief form of this type is quarries, which found around almost every settlement, round or square, with a depth reaching up to 5-6 m in some places. As a rule, soil and vegetation cover is severely disturbed around the quarries due to the movement of vehicles. The impact on the natural environment of industrial civil construction is currently manifest, in general, localized. Only within the framework of industrial buildings, the separate construction of an object and the territories adjacent to it is it manifested in violation of the soil cover and activation of deflation, ravine formation, and the formation of technogenic soils. It is also possible to increase the level of groundwater and the associated hydrostatic weighing of rocks, flooding of basements, swelling of clay rocks, subsidence of loess and loesslike rocks, subsidence of the earth's surface.

Today, the longest Kigach aqueduct is Mangyshlakyu. It transports fresh water of the river. Kigach (left tributary of the Volga) to the Mangyshlak peninsula, simultaneously providing water supply to many settlements of the Atyrau region, including such large ones: Kulsary, Makat. The Kigach aqueduct supplies water to all large industrial enterprises of the Atyrau and Mangistau regions, in particular, the Bolashak plant of the North Caspian project, the Tengiz field with its entire complex. Today it is the only source of water for oil fields, since the region is poor in water resources, except for the main artery of the region in the north - the Zhayik River. From a Zhayik River where a canal to the eastern part of the region is drawn, about 60 km long, up to 3 m deep, for drinking needs of the population. Because of the interaction of this type of complex, various forms are create: dams, canals, pits, bridges. Wells, artesian and hydrogeological wells, existing and destroyed reservoirs are also separate forms.

So, the analysis of technogenic changes in the environment allows us to conclude that the territory is most susceptible to geomorphological risks with the development of sandy clay and loose deposits. It is in these territories that numerous artificial forms are create that are constantly changing, forming new landforms under the influence of exogenous processes, causing deeper changes in the natural environment. In emergency, technogenic processes can become more complex and dangerous in any area. Therefore, when implementing any project, it is necessary to consider environmental measures. Without this, in modern conditions it is generally impossible to exploit the natural resources of nature.

**Reference**

1. Abdulin A.A., Votsalevsky E.S. Fuel and energy resources of Kazakhstan. // Geology of Kazakhstan. 2001. No. 3-4. p. 86-92.

2. Kushimova A.G. The technogenic factor of modern technomorphogenesis of the Priembinskoe oil-bearing region. //Bulletin of KazNU. Geographical series. No. 1. p. 46-50. 2000.

3. Materials of the Atyrau hydrogeological expedition. 1996. Atyrau.