



## **Geocryological hazards and destructive exogenic geological processes on lines of linear constructions of tundra and forest-tundra zones of Western Siberia**

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Economic development of northern oil- and gas-bearing regions, even by application of shift method, is accompanied by a construction of the linear transport systems including automobile- and railways. Construction of such roads is connected with the risks caused by the whole complex of hazards, defined by the environmental features of the region, including flat surface with strong marshiness, development of a peat, fine-grained and easily eroded friable sedimentations, as well as by complicated geocryological conditions.

Geocryological conditions of Western Siberia area are characterized by a rather high heterogeneity. This implies the strong variability of permafrost soils distribution, their thickness and continuity, depths of seasonal thawing and frost penetration, and also intact development of geocryological processes and phenomena. Thermokarst, thermo erosion and thermo-abrasion develop in the natural conditions. These processes are caused by partial degradation of permafrost. A frost heave also occurs during their seasonal or long-term freezing.

Failure of an environment, which is always peculiar to construction of the roads, causes reorganization of geocryological systems that is accompanied by occurrence of dangerous geocryological processes, such as technogenic thermokarst (with formation of various negative forms of a relief: from fine subsidence up to small and average sized lakes), frost heave ground (with formation frost mound in height up to 0,5 - 1,5 meters and more), thermal erosion (gullies and ravines with volume of the born material up to several thousand cubic meters). Development of these destructive processes in a road stripes leads to emergencies owing to deformations and destructions of an earthen cloth, and to failure of natural tundra and forest-tundra ecosystems.

The methodical approaches based on typification and zoning of the area by its environmental complex have been developed for an estimation of geocryological hazards at linear construction. The estimation was carried out on the basis of the analysis, including features of geocryological processes development in natural conditions and certain types of geocryological conditions; character of the failures caused by construction and operation of roads; hazard severity of destructive processes for certain geotechnical systems of roads.

Three categories of territories have been specified as a result on base of hazard severity: very complex, complex and simple. Very complex ones are characterized by close to 0 °C by average annual temperatures of soils, presence massive pore and it is repeated- wedge ices, a wide circulation it is high ice bearing ground and active modern development of processes thermokarst, thermo erosion and frost heave. Simple territories differ in low average annual temperatures of soils (below -4 °C), absence massive underground ices and weak development of geocryological processes. All other territories representing potential hazard at adverse change of an environment are classified as complex territories.