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CONTROL ID: 1791723

TITLE: Human-Modified Permafrost Complexes in Urbanized Areas of the Russian North

ABSTRACT BODY: Economic development in permafrost regions is accompanied by modification of natural geocryological conditions. Drastic landscape transformations in urbanized areas on permafrost are characterized by changes of heat and moisture exchange in permafrost – atmosphere system, and by engineering and technogenic influence upon the frozen ground, leading to alteration of its physical, thermal and mechanical properties. In northern cities this leads to overall increase of ground temperature relative to undisturbed areas and intensification of hazardous cryogenic processes in areas under engineering development, which together leads to reduction in stability of geotechnical environment. For example, deformations of structures in Norilsk district, Northern Siberia, in the last 15 years, became much more abundant than those revealed throughout the previous 50 years. About 250 large buildings in the local towns were deformed considerably due to deterioration of geocryological conditions, about 100 structures were functioning in emergency state, and almost 50 nine- and five-storey houses, built in the 1960-80s, have been recently disassembled.

Increase in accident risk for various facilities (water and oil pipelines, industrial enterprises, etc.) enhances the technogenic pressure on permafrost, leading to the new milestone of changes in permafrost characteristics, i.e. to creation of “another reality” of geocryological conditions. Social and natural factors dictate clustered spatial pattern of industrial development in permafrost regions. Cryogenic processes within the urban areas on permafrost are seldom similar with those under the natural conditions as intensity, duration and extent of the processes changes under technogenic impacts. Moreover, new cryogenic processes and phenomena may occur, which have not been typical for a given region. This makes mapping and characterization of these processes difficult task. Peculiar natural-technogenic geocryological complexes (NTGC) are formed in the urban territories, which are characterized by modified permafrost characteristics, by the new set of cryogenic processes, and by modified temperature trends. NTGC classification depends on initial natural settings and on type, intensity and duration of technogenic pressure. For instance, field reconnaissance of permafrost and geological conditions resulted in characterization of 17 NTGC types in Norilsk industrial area, 11 types in Yamburg Gas Condensate Field, Tazovsky Peninsula, and 32 types along gas and oil pipelines in the north of Western Siberia. Particular interest presents the dynamics of NTGC depending on the scale of urban system, on the set of its elements and on duration of technogenic impacts on permafrost. Important aspect is assessment of climate change impacts on structures and environment in various areas on permafrost

CURRENT SECTION/FOCUS GROUP: Global Environmental Change (GC)

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INDEX TERMS: 0702 CRYOSPHERE Permafrost, 0768 CRYOSPHERE Thermal regime, 0760 CRYOSPHERE Engineering, 4330 NATURAL HAZARDS Vulnerability.

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