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Environmental Consequences of Urbanization in Permafrost Areas

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Introduction

Most of northern cities are anthropo-natural systems with domination of anthropogenic components. The environmental framework of the permafrost zone is very insignificant, with green belts being represented by small parks and public gardens. Modern northern cities of Russia represent territories with dense and compact residential buildings having simple configuration to reduce heat loss under severe climatic conditions. In earlier settlements such buildings alternate quite often with private one-storey houses. The typical modern and old cities were investigated for study of its environmental impact.

Purpose

The goal of this presentation is analysis of main environmental problems in permafrost areas of Northern Russian territories using data of city infrastructure and permafrost and environmental processes monitoring for old and new developing cities.

Results

It was found that primary anthropogenic changes of cities' environments are following: soil devastation, change of surface water and groundwater, stationary and dynamic loads, pollution, change of thermal state of soils, accumulation of occupation layer, waste dumping. It is practically impossible to preserve natural permafrost conditions. Therefore we can observe in all cities of the permafrost zone degradation or, more rarely, aggradation of permafrost grounds depending on natural and permafrost conditions, construction principles, density and age of constructions, development of the territory and many other factors. The degree of change in various natural components of various permafrost zones varies, depending on the initial natural conditions in which economic activity is carried out, its type and duration. This entails various ecologic situations ranging from normal to crisis or disaster.

Conclusion

Significant changes of geocryological and an ecological situation are marked only at dense modern multi-storey building city territories. In these cases there is a degradation of permafrost soils irrespective of principles of preparation of the bases and constructions.