



Permafrost Hazards and Linear Infrastructure

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The international experience of linear infrastructure planning, construction and exploitation in permafrost zone is being directly tied to the permafrost hazard assessment. That procedure should also consider the factors of climate impact and infrastructure protection. The current global climate change hotspots are currently polar and mountain areas. Temperature rise, precipitation and land ice conditions change, early springs occur more often. The big linear infrastructure objects cross the territories with different permafrost conditions which are sensitive to the changes in air temperature, hydrology, and snow accumulation which are connected to climatic dynamics. One of the most extensive linear structures built on permafrost worldwide are Trans Alaskan Pipeline (USA), Alaska Highway (Canada), Qinghai-Xizang Railway (China) and Eastern Siberia – Pacific Ocean Oil Pipeline (Russia). Those are currently being influenced by the regional climate change and permafrost impact which may act differently from place to place. Thermokarst is deemed to be the most dangerous process for linear engineering structures. Its formation and development depend on the linear structure type: road or pipeline, elevated or buried one. Zonal climate and geocryological conditions are also of the determining importance here. All the projects are of the different age and some of them were implemented under different climatic conditions. The effects of permafrost thawing have been recorded every year since then. The exploration and transportation companies from different countries maintain the linear infrastructure from permafrost degradation in different ways. The highways in Alaska are in a good condition due to governmental expenses on annual reconstructions. The Chara-China Railroad in Russia is under non-standard condition due to intensive permafrost response. Standards for engineering and construction should be reviewed and updated to account for permafrost hazards caused by the climate change. Extra maintenance activity is needed for existence infrastructure to stay operable. Engineers should run climate models under the most pessimistic scenarios when planning new infrastructure projects. That would allow reducing the potential shortcomings related to the permafrost thawing.