



## **Investigating impact of extreme weather in the Arctic on mining facilities and urban environment**

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It is clear that communities around the world are facing increasing risks due to climate change and occurrence of extreme weather events. Extreme weather events can be very unexpected and hazardous for buildings and roads in the urban environment, for such critical facilities as mining waste tailings, dams, underground communication lines and pipes etc. Hence knowledge of the risks of climate change and extreme weather is important before designing and building new infrastructure and critical facilities. From the other hand, rapid warming of the Arctic (Gillett et al. 2008) attracts more businesses and activities to the area. In particular, mining in the Arctic Region is expanding due to increasing need of mineral resources. Development of mining industry can have a positive effect on local communities (for example, job creation, common infrastructure development). Mining in cold climate conditions is a challenging task, however, and may result in negative impacts on both the environment and on local communities, if the environmental issues are not treated in proper way. This, in turn, can have a negative impact on local communities and public opinion concerning mining activities (social license to operate: SLO). This is an urgent problem for Finland where mining critical facilities (open pit mines, mineral processing and concentration plants, mining waste storage facilities) are located close to urban settlements. Extreme weather in the Arctic can affect mining industry and urban infrastructures in a complex way, via mutual interaction with solid earth shallow subsurface and underground water. For Arctic climate conditions an example of weather extremes affecting mining facilities and urban environment can be rapid temperature decrease resulting in rapid freezing of underground water which, in turn, results in bedrock rupture at shallow depth and damage to basements of buildings, mining waste storage facilities. In our research project we investigate the effects of climate change, variability and extreme weather on mining facilities and urban environment. For this we study dynamic response of shallow solid earth subsurface and underground water to the primary processes caused by variable climate and extreme weather events and evaluate the influence of these dynamic processes on selected examples of urban infrastructures and mining facilities in northern Finland.