

Freshwater management issues in an Arctic island settlement - challenges and potential impacts

Hanne Kvitsand

SINTEF, Trondheim, Norway

Abstract

This research discusses challenges related to water supply and management in a remote Arctic Island community in light of risks related to climate change. Longyearbyen, the largest settlement in the archipelago of Svalbard (78 N), has only one available source of drinking water for its 2500 inhabitants and around annual 160 000 tourists. This source is a shallow (< 5 m) dammed lake, of which the water recharge mechanisms are not well documented, and which is already associated to water security uncertainties due to the dam construction and the vulnerability to contamination.

Rivers and lakes are the most common sources of drinking water in the Arctic. These surface water sources typically freeze up during winter and often exhibit a low water quality due to high suspended sediment loads from glacier meltwater and from contaminants originating from land use. In high Arctic regions, permafrost plays a key role in the water cycle, as frozen ground acts as an impermeable barrier between surface water and the subsurface. A future risk for the Longyearbyen water supply is how global warming and permafrost degradation may affect the water source itself - will the water drain away? If the drinking water falls out there is no alternative water source, and the long distance to the mainland challenges rapid emergency preparedness assistance. This is a preparedness problem also in case of a fire.

In this paper we elaborate the nature of freshwater in a permafrost region, the (lacking) interaction of supra - and subsurface water, freshwater vulnerability, demand and management, and discuss measures for securing water supply to Arctic communities in a changing environment. How can we best facilitate predictable management of freshwater sources and critical infrastructure in an Arctic climate?

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