

Case study 7

Problems of living in periglacial environments

The hazards associated with the use of periglacial areas are diverse and may be intensified by human impact. Problems include mass movements such as avalanches, solifluction, rockfalls, frost heave, icings as well as flooding, thermokarst subsidence (Figure 7.11), low temperatures, poor soils, a short growing season and a lack of light.

For example, the Nyenski tribe in Siberia have suffered as a result of the exploitation of oil and gas. Oil leaks, subsiding railway lines, destroyed vegetation, decreased fish stocks, polluted breeding grounds and reduced caribou numbers have all resulted from efforts to exploit the remote and inhospitable environment.

Traditionally, periglacial pastures have been used by Inuits for herding or hunting caribou. The abundance of lakes allows travel by float plane, and the lack of trees and frozen winter rivers enables overland travel. Periglacial areas are fragile for two reasons: firstly, the ecosystem is highly susceptible to interference, because of the limited number and diversity of species involved. The extremely low temperatures limit decomposition. Thus pollution, especially oil spills, have a long lasting effect on periglacial ecosystems.

Secondly, permafrost is easily disrupted, posing significant problems. Heat from buildings and pipelines, and changes in the vegetation cover, rapidly destroy it. Thawing of the permafrost increases the active layer and subsequent settlement of the soil cause subsidence. Consequently, engineers have built structures either on a bed of gravel up to 1 m thick for roads, or used stilts. Close to rivers, owing to an abundant supply of water, frost heave is very significant and can lift piles and structures out of the ground (Figure 7.12). Piles for carrying oil pipelines therefore need to be embedded deep in the permafrost to overcome mass movement in the active layer. In Prudhoe Bay, Alaska, the piles are 11 m deep. However, this is extremely expensive; each one cost more than \$3000 in the early 1970s.

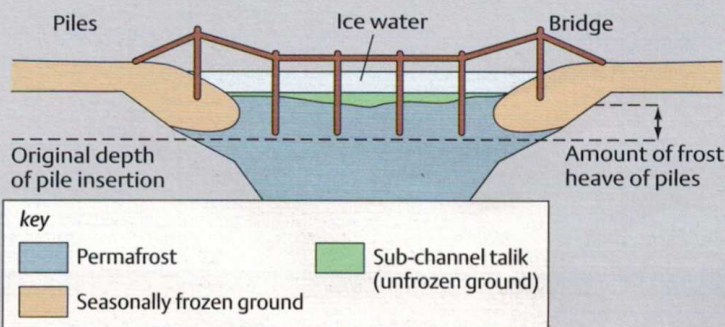


Figure 7.12 Effect of frost heave

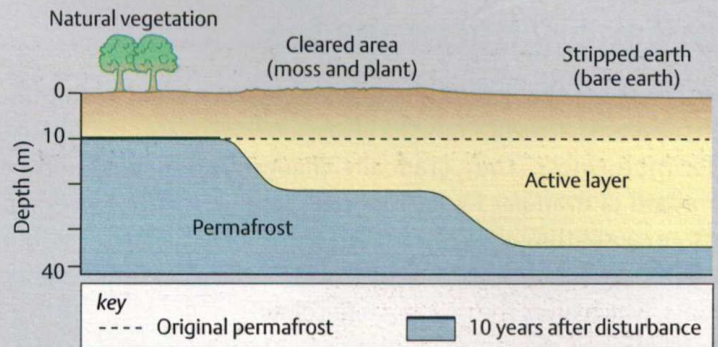


Figure 7.11 Effect of disruption to permafrost

Services are difficult to provide in periglacial environments. It is impossible to lay underground networks, hence **utilidors**, insulated water and sewage pipes, are provided above ground (Figure 7.13). Waste disposal is also difficult owing to the low temperatures.

Alpine periglacial areas suffer environmental pressures. Traditional economies have declined at the expense of electro-chemical and services industries, especially tourism. An elaborate infrastructure is required to cope with the demands of an affluent tourist population, and this may undermine the natural environment and traditional societies.

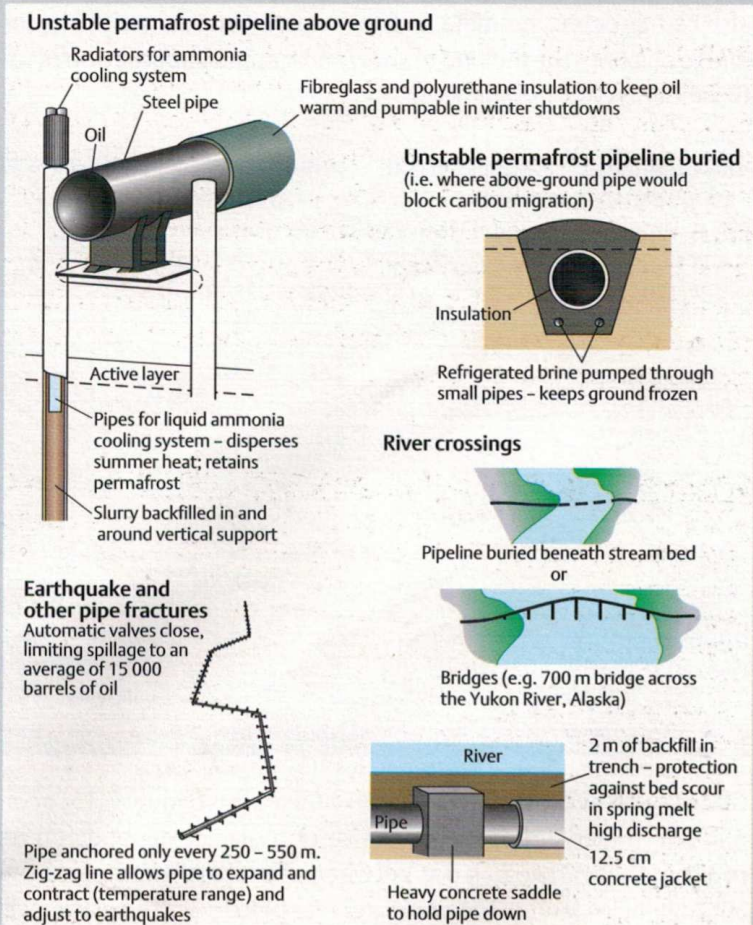


Figure 7.13 Factors that influence thawing in permafrost areas