Melting glacier floods Arctic coal mine, highlighting climate change irony

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Abandoned mine entrances near Longyearbyen, Svalbard. When the mines are no longer operating, their infrastructure is left behind as a mark on the landscape. Credit: Rasmus Gjedssø Bertelsen

On July 26, Svalbard's only active coal mine, Gruve 7, was reported to be flooded by its operators, Store Norske Spitsbergen Kulkompani. It had been shut down earlier this year due to the ongoing COVID-19 pandemic; now plans to reopen the mine will now be delayed even further as a result. Glacial meltwater entered the mine through a crevasse at the junction between the overlying ice cap and glacier below, and seeped through from cracks in the bedrock. The floodwaters damaged the mine's one power supply, so the three pump systems installed to remove water were unable to operate. Workers at Store Norske are currently conducting an assessment of damage to equipment and facilities.

Svalbard is a Norwegian archipelago in the high Arctic. It has a rich political history, marked by exploration, exploitation and enmity. Prior to the Svalbard Treaty of 1920, Svalbard was a terra nullius—a land without formal government. The treaty, part of the wider peace treaty of Versailles (which brought an end to World War I), designated Svalbard to Norwegian rule, but allowed a number nations to remain present in Svalbard. This ambiguous status was a particular target for Russia, which currently is the only other country exercising this right to occupancy in Svalbard. The history of the archipelago centers around the pursuit for its resources—namely whales, coal and fish—and the geopolitics that competition for these resources has ignited. Sea ice has long been a physical obstacle to the archipelago's exploration and exploitation, but climate changes and loss of sea ice have opened opportunities for nations with an interest in Svalbard.

The great coal rush, which began at the close of the 19th century, ended before the 1930s, but the Soviet Union and Norway still continued mining on Svalbard, despite declining economic opportunity. In 1949, realizing its neutral stance was no longer a possible form of defense, Norway became a founding member of NATO. This status asserted Norway as a potential rival to the Soviet Union during the Cold War for

territory in the Arctic. The rivalry was heightened by the shared border at the northern extreme of Europe. Through the rest of the 20th century and the collapse of the Soviet Union, both Norway and Russia continued to mine coal as a means of asserting their presence in the Arctic, particularly on Svalbard due to its proximity to nuclear weapons carried in submarines in the surrounding waters. The Norwegian government has long subsidized coal mining in Svalbard, even though very little commercial value now remains—the majority of coal from Gruve 7 is used to supply the only coal power plant on Svalbard. The mining industry has therefore represented the long-standing tensions between the two nations. Although Russia currently agrees that diplomatic negotiations in the Arctic must be a priority for all, its history of territorial claims suggests that its current cooperation as a member state within the Arctic Council may not represent its future actions.

For the past two decades, coal mining has been increasingly threatened by water intrusion from nearby melting glaciers and ice caps. In the days preceding the flooding of Gruve 7, a record temperature of 21.7 degrees Celsius had been recorded in Svalbard, causing sustained glacial melt and rivers to discharge four times their usual volume. The phenomenon of Arctic amplification, whereby temperatures are increasing at a greater rate in the Arctic compared to mid-latitudes, has fueled rapid glacial melt.

Andy Hodson from The University Center in Svalbard has been monitoring the ice cap above the Gruve 7 mine since 2006. His team usually records over half a meter of winter accumulation each year, but this year they have only seen 0.25m of accumulation and 1.8m of water equivalent ice loss. These are by far the worst readings on record, he told GlacierHub. The meltwater can enter the mines because excavation of coal creates cracks in the glacier bedrock, which permit water flow.

Researchers from the University of Oslo, led by Kjetil Melvold, have

conducted studies into how to remove water from the coal mines in this remote and inhospitable setting. Attempts have been made to connect the mine to the ice-bedrock interface so flood water can drain through local subglacial conduits, although this requires efficient channelized drainage systems to be present in the area near the mine. Other proposals have included artificial glacial conduits that rely on water pressure gradients between the mine and glacier bed to drain water out of the mine.

Researchers from The University Centre in Svalbard conducting fieldwork to obtain mass loss data from the ice cap above Gruve 7 mine. Credit: Paolo Verzone

The Svalbard coal mining industry is not only threatened by the

imminent melting of glaciers, but also from international environmental lobbyers. In 2015 the UN's executive secretary on climate change, Christiana Figueres, requested that Norway permanently stop mining on Svalbard, stating that it was inconsistent with the responsibility to uphold the country's commitments to address climate change. More broadly, coal mining in the Arctic has been criticized for the paradoxical inconsistencies between the heavy greenhouse gas-emitting industry in a place on Earth where climate changes are being felt more than ever.

Rasmus Bertelsen, a political scientist at The Arctic University of Norway, believes coal mining will stop after a few more years of operation, and attention will swiftly turn to alternative industries. "When coal mining has ceased there must be alternatives for Norway and Russia to assert themselves on Svalbard," he told GlacierHub. Both nations have pushed for tourism to fill the void; however, on the Norwegian side, space exploration could be the future of their activity. For example, the Norwegian-owned KSAT satellite services, operates a ground station on Svalbard. The future of Russia's presence is less clear. Rapidly vanishing sea ice in Arctic waters threatens the natural defense of the Russian mainland, yet its military weapons near Svalbard will likely mean Russia is keen to continue its assertion in the archipelago, symbolizing its dominance in the Arctic.

The flooding of Gruve 7 by the melting ice cap above not only represents a loss in the battle against climate change, but also the failing coal mining industry that has long been used to exercise sovereignty in a place of strategic importance. Coal mining has undoubtedly had a negative impact due to its intrusive and extractive methods, yet for some political actors, the environmental stain which the mining creates may perhaps be less of a concern than the void it will leave behind when it ceases. The recent flood has brought public attention to this remote archipelago, where geopolitical concerns and an increasingly militarized Arctic will undoubtedly complicate its interactions with climate change.