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Mineral diplomacy in Greenland: learning from US-European history of engagement at the Ivittuut cryolite mine

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Growing extractive and geopolitical interest in Greenland is leading to a confluence of threats and opportunities for communities in determining their future economic development pathways. This paper investigates the diplomatic history of the Ivittuut cryolite mine in Southwest Greenland as part of a larger participatory mapping project focused on interviewing stakeholders in the Arsuk fjord on future development pathways in the Ivittuut region. Ivittuut was a key strategic outpost supporting U.S and European cooperation during World War II. In particular, we define the political process of mineral diplomacy and how cryolite was at the heart of US-European diplomacy in Greenland and how minerals could potentially again be a source of cooperation rather than conflict. Greenland can be a frontline for mineral diplomacy, bridging interests between Europe and the US but key to moving forward with such a process requires critical reflection of who was excluded and included in previous mining engagements. Mineral diplomacy today often reflects colonial extractive pressures and military strategic interests, but we argue that political geology frameworks must be included to ensure that mineral diplomacy processes foster long-term sustainable mineral investment while ensuring local communities and Greenlandic values are protected and included in throughout the process.

KEYWORDS

greenland, arctic, diplomacy, minerals, extractive studies, political geology, mining

Introduction

Greenland is the world's largest island nation and is a self-governing country within the Kingdom of Denmark, controlling most domestic matters of education, health, and natural resource development. Growing geopolitical tensions between the US and Denmark and the quest for independence are putting extreme economic and national security pressures on the nation (Jacobsen et al., 2024; Lindroth, 2020; Mazza, 2015; Taagholt and Brooks, 2016; Thisted, 2019). With an economy of fishing accounting for over 90 percent of its exports, a large yearly Danish block grant subsidy of \$560 million USD, and a limited labor force and low unemployment, the nation is restricted in alternative financing revenues to support its independence from Denmark (Arnaut and Høgedahl, 2022). This has led to growing debate and focus in the mining sector, which could potentially lead to large sources of income and investment which would be used to finance Greenland's independence and development.

Although Greenland has full control over its mineral resource policy since 2009, it is still significantly limited in its foreign policy decision-making capabilities with other countries. The Kingdom of Denmark and its diplomatic units are the primary actors

involved in strategic military planning and broader foreign policy relationships. This complicates mineral development for the people of Greenland, as most mineral partnerships and mineral diplomacy in the modern era are made between government alliances and strategic partnerships containing additional security and economic concessions embedded in the overall agreements. Without proper US embassy representation and state status in the international system, Greenland is limited in these ever increasing military and government-centered mineral proposals. This creates a growing tension between the Greenlanders and Denmark, not over how mineral policy is developed but how it gets funded and the political leverage to negotiate out more equitable deals. It also puts pressure on Inuit leadership to lean deeper into defense and geopolitical discussions, rather than alternative development pathways. With billions of private and public investment on the line, and a host of development projects in flux, there is a need for a nuanced approach to discussing extractive development which reflects local Greenlandic values first and ensures future changes benefit the people of Greenland and the ecosystems they are connected to.

Mineral diplomacy as a political process

We define mineral diplomacy as a political process which recognizes the explicit and implicit role minerals and materials play in influencing geopolitical activities, shaping diplomatic narratives, and creating specific economic and national security conditions which define political engagement between two or more actors. How and whose politics are injected into these various activities and narratives, the power relationships of the actors involved or uninvolved, and the economic assumptions upon which decisions are made require significant intellectual consideration and engagement. While no formal academic scholarship is currently established around mineral diplomacy, the term continues to garner attraction and use by closely aligned organizations such as government agencies, think tanks, and private consultancy firms to define the ongoing strategic process of a country to secure access to and control over critical mineral resources.

Mineral diplomacy is being defined through conflict rather than cooperation, leading to a securitization of the subsurface and focus on state interests in mineral debates, overlooking the multitude of local challenges, and development concerns surrounding most potential mineral projects. While “diplomacy” is often viewed as soft power, most mineral discussions today mirror colonial extractive interests, reducing local agency, and deep-rooted social and cultural challenges in the agreements. The narratives of this diplomacy often require an “other” by whom the actors compare themselves to often in a competitive nature where limited access to minerals and materials means a jeopardization of national interests and corporate longevity. Therefore, mineral diplomacy today reflects the interests of state security and corporations rather than the global community, especially those living near the mine site.

Mineral diplomacy is not a product of modernity around critical minerals or the result of recent great power competition between the US and China, rather it is a fundamental process

of nation-state activities which warrants further theoretical investigation and critique as its political, environmental, and social outcomes impact communities for generations and reshape political processes and narratives around natural resource extraction. Allowing state and corporate interests to shape how mineral diplomacy is discussed, without theoretical debate, has the potential to disenfranchise local communities and impact futures for many generations under the banner for the greater good or national security interests.

As a political process, mineral diplomacy must then be drawn from subjective considerations of theoretical frameworks and political ideologies, which are determined by the narratives around resources at a given moment in time and chosen by the actors engaged in the process. This new push for mineral diplomacy comes at a time when U.S. and China diplomatic engagements are tense and the ongoing trade wars have resulted in multiple supply chain export restrictions. The US is also increasingly engaged in developing “mineral deals” between countries such as Ukraine and the Democratic Republic of the Congo, but little scrutinization of the conflict context in these deals and the narratives employed has been critiqued from a theoretical standpoint. The deals are being made in countries suffering from conflict and political unrest, using powerful figures and state actors to bargain with, rather than local populations and community interests. Greenland is another prime example of a country undergoing rapid change both climatically but also socially as conversations around independence and financing make the political fabric of the country prone to foreign intervention, both private and state-centered. These short-term geopolitical contexts have the potential to backfire, and we argue there is a need for more nuanced discussion around mineral diplomacy and the frameworks that inform it. These deals also do very little to explore the environmental and social challenges around extraction, putting local communities at risk for broader government interests and national security.

We propose the pathway to achieving long-term and sustainable mineral diplomacy must then be derived from literature which addresses political power dynamics of extraction and investigates why certain materials have become influential political agents across history due to their geochemical arrangements and physical properties. This does not ignore the geopolitical or economic, rather it ensures that underlying issues in critical mineral zones are first addressed in these mineral deals, rather than ignored or overlooked. Mineral diplomacy today cannot just be an effort to include a few more players and rules in the game, it must be a fundamental rethink of who benefits and loses from extraction, who is excluded, and how state and corporate power can reduce local community influence on decision-making processes. To this end, political geology provides a useful praxis for enhancing mineral diplomacy and supporting more sustainable avenues of this political process.

Employing a political geology approach broadens the discussion to consider multiple temporalities, human-environment relations, and multiple possible futures, including those on the periphery of extraction. Political geology emerged from interests in anthropology and geography in understanding “how geological knowledge-making, representation and thought have inscribed and are reinscribed by political activities,” (Bobbette and Donovan,

2019). It understands the discipline of “geology as a tradition of knowledge that has pre-figured how the geos came to be known in the present” and recognizes “the traditions and people that have been systematically and violently excluded from that project” (Bobbette and Donovan, 2019, p. 26). The production of geological knowledge is understood as inextricable from colonial projects, which transformed the surface of the earth into “vertical territory,” (Braun, 2000) which could then be known, governed, and extracted. External and state political interests are therefore more concerned about “securing the volume” rather than “securing the area” (Elden, 2013). The concept of “secure the volume” in mineral diplomacy addresses more appropriately the complexities in modern geopolitics, especially where subsurface politics are extremely relevant in political discourse. As Bennett (2023) notes, “Going forward, struggles over Indigenous rights may concern securing ownership over not only the land base, but the land column.” Braun (2000) contends that by understanding the temporality of geological knowledge and how it shaped perceptions of nature, we can see that geological insights played a crucial role in the formation of governmental practices related to land use, resource management, and the organization of society. This transformation allowed the state to perceive and govern its territory. As Elden (2014, 2017) poses: a broad question that guides our interest is therefore “how should the geopolitical take account of the geophysical?”

The field of political geology and critical research on Greenland co-emerged over the 2010s. Concerns over the global impacts of the melting ice sheet exist uneasily with the fact that retreating ice makes hard-rock mineral deposits available (Nuttall, 2017; Nuttall and Nuttall, 2024), many of which are categorized as “critical” for energy and military purposes, while legacy pollution from previous mining activities remains unaddressed (Søndergaard and Mosbech, 2022). This shows how anthropogenic, geologic, cultural, and political economic interests intersect (Nuttall, 2021). Examining the nature of the extractive industries in Greenland, Nuttall (2023, p. 11), writes how “political geology matters in the making of an extractive frontier and the regulation of extractive terrain.” Bruun (2018, p. 28) discusses how Greenland’s uranium “has become increasingly entwined with questions of economic sustainability and independent sovereignty,” while Nuttall (2023) looks at how “acquiring knowledge of subsurface environments has been crucial for matters of securitization,” which corporate actors have leveraged to frame broader debates on extractive activity, amidst other competing development agendas such as tourism. Blanchard (2019) examines how these discourses and interests reinforce the trope of a “New North” open to extraction, which considers Greenland’s particularities in the context of “a changing Arctic” (Kristensen and Rahbek-Clemmensen, 2018). This scholarship centers questions of coloniality and independence (see also Bruun, 2018; Nuttall, 2001, 2012, 2021), which Klinger (2017) and Dodds and Nuttall (2017) examine in terms of broader resource geopolitics. This attention to the (neo)coloniality of external interests in Greenland’s geological endowments has also contributed to discussions of decolonizing geology in practice (Bobbette et al., 2020, p. 654). Notably, none of the works mentioned above include the case study of Ivittuut, which is the most prolific site of diplomatic engagement over strategic resources in Greenland’s limited mining history. Putting this into

practice—in other words, ensuring “the whole package is there”—mineral diplomacy requires intentional critical investigation of the geological power dynamics and political actors engaged in the process, in order to engage the perspectives and artifacts from multiple hierarchical positions that lay claim to land use and development pathways.

Study context

This paper is situated within the broader context of the Arctic amidst growing interest to extract mineral resources essential for the energy transition and defense technologies during a period of increasing geopolitical tensions between the US, Greenland, and Denmark. Despite its small size, Ivittuut is a site crowded with overlapping contexts, visions, and interests, uncovering potential power conflicts and colonial histories which require thoughtful investigation and further discussion.

The study was conducted as part of a larger incubator project under Navigating the New Arctic (NNA) to identify and explore post-industrial mining infrastructure across various sites in the Arctic Circle (Greenland, Finland, Sweden, Alaska, and Canada). These case studies culminate under a broader title known as STAR, or Sustainable Transitions through Arctic Redevelopment. STAR capitalizes on the synergy of existing Arctic infrastructure research by bringing together current and future stake-, rights- and knowledge holders, scholars, and local communities to understand future development pathways during a time of increased interest in Arctic mineral exploration and the need for environmental justice in the face of climate change. Ivittuut was chosen given its historical and strategic significance to Greenland and the new development interests surrounding the site.

The purpose of this study was to identify various visions for the site to better understand and conceptualize the future while also detangling conflicting interests which are brought up in diplomatic discourses over mine development. Most of the literature on Ivittuut is also focused on the geoscience and subsurface resources, rather than the social and political realities surrounding the mine’s history. While studies and commentaries do exist on the challenges of Ivittuut’s history, they are often internally discussed within Danish academia and popular commentary, limited to the Danish language and never translated into English. This study recognizes that the challenges and history of Ivittuut, especially during ongoing tensions between the US, Greenland, and Denmark, could provide potential avenues for reflection and understanding of how to move forward and prevent past mistakes while also recognizing the need for continued mineral diplomacy with Greenlandic-led discussions. The study also informs the literature on regional economic development in Greenland and the Arctic amidst climate change, where subsurface geologies are becoming increasingly important in broader geopolitical narratives and are defining diplomatic dialogues.

This research was conducted prior to the release of the Danish documentary *Grønlands hvide guld* (Greenland’s white gold) in early 2025, which asked Danes to confront their colonial heritage and economic capture over the Ivittuut Cryolite Mine and the legacy impacts of the community of Arsuk. While the film has

received significant criticism and ongoing debates surrounding the economic statistics used in the documentary, there is still a broader context of ongoing debates around the colonial history of extraction, financing independence through mining, and the processes of exclusion and economic capture by large state actors over indigenous populations and local communities living around mine sites. These issues should not be overshadowed by the editorial issues of the documentary, rather they require significant reflection in hopes to improve future mineral development planning in Greenland. This film and the vigorous debates within Greenlandic and Danish society have brought Ivittuut back into cultural conversations and it emphasizes the importance of understanding why mineral diplomacy must be a process in which power dynamics are investigated and local community perspectives are included. Without this recognition, more stories like Ivittuut could define Greenland's political and economic future.

Methods

This paper resulted from a broader project surrounding participatory mapping community workshop around development pathways for the Arsuk fjord in Ivittuut, Greenland (Hale et al., 2024). The workshop allowed stakeholders to discuss and map out their various zones of interest on physical maps which were used to establish various future development pathways. The workshop also allowed stakeholders to have a preliminary discussion on how far along certain project timelines were and opportunities for collaboration or potential conflict in development interests. The study went through review and approval from the IRB at the University of Delaware and all subjects interviewed were provided opportunity for informed consent of their views being used in our research. The research team was reinforced by and included a local Greenlandic consultant living in Nuuk who supported the study by organizing interviews, supporting travel logistics, organizing and developing a community workshop, and translating interviews. Our Greenlandic partner was included in all of the dialogues, interviews, and planning throughout our stay. In addition, our team worked closely with a former Ivittuut resident who lived and worked at the mine during the military occupation.

Interviews were conducted in two visits to better understand the history, current politics, and development history of the Ivittuut Cryolite Mine. The first trip included 2 weeks in the capital of Nuuk, interviewing local researchers, Sermersooq and Kujalleq municipality authorities, mining cooperatives, government officials, researchers at the Greenland Institute of Natural Resources, the Danish Joint Arctic Command (JACO), and Arsuk community members who lived at and were familiar with Ivittuut and Arsuk's historical development and held political positions in the former Ivittuut municipality. Stakeholders unable to meet in person were interviewed virtually.

An additional trip was conducted by the lead author who was invited during the summer of 2023 to join HX Expeditions, a Norwegian cruise company, as a guest scientist. This included a site visit to the Ivittuut mine, a trip completed by only a few vessels a year. The author was guided by someone who lived at and worked at the mine during its final years and who had not

been back since. During the trip, Greenland's tourism directors and Greenlandic Association of Arctic Expedition Cruise Operators (AECO) representatives were also on board to discuss the region's history and colonial legacies, along with geotourism efforts to preserve and share the story of the community of Arsuk. Many conversations are ongoing with former residents and stakeholders in the region to develop an interactive map of the history of Ivittuut to be used to share stories about these complex political realities in hopes to bring awareness to the future of mineral development in Greenland.

Stakeholder backgrounds included mining company leadership, the Greenlandic mining cooperative, Sermersooq and Kujalleq municipality leaders, a JACO high-ranking official, the US Consulate, the Ministry of Housing and Infrastructure, local consulting firms in Qaqortoq supporting the mining company, the former owner of the Ivittuut mineral license, Greenland Institute of Natural Resources officials, local and foreign Greenlandic scholars, and local community members.

Current Ivittuut studies

Well-studied for its geologic and historical significance, Ivittuut lacks significant critical research confronting the human-environmental nexus and colonial legacies of extraction. Only three major social science academic projects have been conducted in recent years. Heikkinen et al. (2020) looked at the challenges surrounding cruise-led tourism at the Ivittuut mine and how the local community of Arsuk, while interested in leading tours and selling souvenirs, did not have the language and infrastructure capacity to handle the visit, leading to the community being unaware of what was actually going on during the tourism landings. Bjørst (2020) looked at the memories and cultural encounters among locals, miners, and military personnel in Greenland's Arsuk Fjord, highlighting how these narratives reveal complex power dynamics, industrialization, and a shared sense of connection and grief tied to the region's past and future. Finally, Ren (2023) shows the story shows how Grønnedal is imagined through tensions of liminality and centrality, abandonment and potentiality and feeds into ongoing, larger discussions of the possible future(s) of Greenland as actors deliberate on how Grønnedal could become a place for tourism, but also as an engine to rebuild regional infrastructure.

Despite fading into the periphery of many scholarly observers, the finances produced by Ivittuut under the control of Kryolitselskabet Øresund A/S between 1939–1987, produced much of the geologic knowledge and exploration of ore deposits in the south which are capturing attention from junior explorers to minerals for the energy transition (Christiansen, 2022; Keto, 1998). Cryolite gave the allies an upper hand in the aviation industry for the war effort due to helping reduce the melting point during the process of alumina smelting. The site is now operated by Eclipse Metals Ltd., an Australian junior explorer who hopes to mine the high-grade quartz and eventually develop a nearby carbonatite deposit on the lease for rare-earth elements (Eclipse Metals, 2024b).

Comprehensive scientific studies investigating lead and zinc pollution from the mine and its impact on blue mussels around the site has been conducted, but no remediation efforts have taken place

to date (Zimmer et al., 2011). In addition, the Greenland Institute of Natural Resources and the Sermersooq Municipality investigated the capability of shrimp shells or construction demolition concrete as amendments to immobilize Pb and Zn elements to mitigate mine drainage (Jia et al., 2023). Other researchers have focused their interest in the unusual geologic formations known as ikaite tufa columns in the adjoining Ikka fjord, calling for the site to become a world heritage designation (Aðalsteinsdóttir et al., 2025; Buchardt et al., 2001; Seaman et al., 2022; Stockmann et al., 2022). Community-led research has also taken place to better understand community-led harvesting and trophy hunting in the Ivittuut region, which is a significant economic stimulus for the nearby community of Arsuk outside traditional fishing (Cuyler et al., 2020). While not publicly available, meetings during the fieldwork uncovered Danish military plans for remediating the environmental challenges in Kangilinnguit (Grønnedal), a military station, connected to the mine site. However, these studies have not assessed the cross-connected interests and whether or not the various pathways have the potential to co-exist or result in increased tension in the region. The geoscience literature on Ivittuut has also neglected socio-political legacies with the nearby Arsuk community, overlooking the influence of these realities on modern mineral diplomacy discourses between the three countries.

Greenland's cryolite heritage

Ivittuut, or “the place where there is plenty of vegetation,” (often referred to as the grass-rich) is a former mining town which operated from the late 1800s to the late 1980s (Upton et al., 2003). It is characterized by a zoned mineralized ore body within an alkali-rich granite intrusion and is world-renowned for its hydrothermal cryolite deposit, an important mineral used in the extraction of aluminum from bauxite ores (Berthelsen, 1962; Ljungdahl, 2011; Köhler et al., 2008). To date, the deposit remains the largest and most significant cryolite discovery in the world, with a diameter of 300 meters and an estimated resource of 12.3 million tons of cryolite, all of which has been depleted (Eclipse Metals, 2024a; Berthelsen, 1962). Synthetic cryolite today comes from mining fluorite, but the importance of Ivittuut during World War II made it the most prolific mine in Greenland's history (Berry, 2012). The mineral also transformed aluminum production, making it a ubiquitous material in society.

Earliest interaction with cryolite dates back to local Inuit communities who visited the fjord for fishing and hunting and noticed the eroded white material on the hillsides (Lloyd, 1953; Knauff, 1894). Stories from local communities suggest that the deposit had been known by many for generations, with the cryolite being referred to as “seal blubber stone” and potentially being used as sinkers on fishing lines due to its softness for carving (Secher, 2018; Taylor, 2021). An exhibition held in Copenhagen in 1795 showcased some of the first cryolite from Ivittuut and by 1799 the first description of the mineral was published by Danish veterinarian and physician Peter Christian Abildgaard. Derived from the Greek language words cryos (frost) and lithos (stone), cryolite was classified as “the ice that never melts.” It is a sodium hexafluoroaluminate [Na₃AlF₆], with aluminum and fluorine being essential elements for its industrial applications.

The earliest shipment for industrial research was sent to Austrian scientist Karl Ludwig Giesecke in 1807, who visited Greenland between 1806–1811 (Taylor, 2021; Whittaker, 2007). The Second Battle of Copenhagen resulted in the material being taken away to Edinburg, Scotland as spoils of war, remaining unexamined until 1822 (Lloyd, 1953). Giesecke would be known by many as the “discoverer” of the cryolite deposit, but personal accounts suggests he recognized the indigenous knowledge of the site prior to arrival (Whittaker, 2007):

“We owe the first discovery of cryolite to the Greenlanders, who, in finding it to be a soft substance, employed the waterworn rounded fragments as weights on their anglings... it was of course incorrectly stated in some periodical papers, that the cryolite was discovered by me; I only found its geological situation, and I dare say by a mere accident.”

Already in 1825, Danish scientist H. C. Ørsted produced pure aluminum as the first scientist in the world, but his teaching commitments prevented him from having the time to explore this new metal himself (Kragh, 1995). By 1853, Danish scientist, Julius Thomsen, became the first to prove and patent cryolite's commercial source for soda, an essential cleaning agent for the growing chemical industry during the mid-19th century (Kragh, 1995). This began the first industrial phase at Ivittuut starting in 1856 with 100 tons of ore being shipped out of the Arsuk fjord by skinboats to Qajartalik island, where bigger sail ships waited. Full production began in 1857, but smaller shipments were already being picked up in 1854.

In 1886, Charles Martin Hall and Paul Héroult independently developed a process for making aluminum from alumina, significantly increasing the demand for cryolite as a primary ore of aluminum (Secher, 2018). A year later, Karl Josef Bayer patents his process for extracting alumina from bauxite from Les Baux-de-Provence in France, making cryolite a key flux in reducing the melting temperature and delivering aluminum twice as efficiently as previously known, using half the amount of energy (Luckow and Fisker, 1977; Habashi, 2016). By 1889, commercial production of metallic aluminum started with the Hall-Héroult aluminum electrowinning process of the cryolite-alumina melt, changing the aluminum industry and modern industrial society (Prasad, 2000).

Ivittuut and the Arsuk community

On the periphery of the extraction was a much more contentious colonial story regarding the relationship to the Arsuk community and native Greenlanders who lived nearby the mine site. From the onset of the mine's development, the Danes organized Ivittuut as their own European enclave, completely separate from the rest of Greenlandic society and political issues. During most of the mine's history, the workers and staff at the site were foreigners. Locals were considered unable to actively engage in the mining workforce due to the lack of skills and safety expertise required at the mine. It wasn't until the limited supply of workers during World War II that indigenous communities were employed in service jobs in the community (Lloyd, 1953). Limited trade did occur between the two settlements and many workers eventually

had relationships with local Greenlanders, leading to many Arsuk community members today being descendants of Ivittuut. While some workers came and left, others stayed for many years, some establishing businesses and families in Greenland.

Employment was the least of the concerns to local Arsuk residents, as most of this early history prohibited Greenlanders from getting anywhere near the mine site, creating challenges for accessing the flourishing fishing spots and glaciers further up the Arsuk fjord. The mine site also did not report operations in the Greenland Government's published records, nor was the settlement included in the Greenland Census (Lloyd, 1953). The mineral concession license was also tax-free from customs and excise duties, further establishing the site as a colonial space where none of the finances would make their way back to Greenlandic society (Lloyd, 1953). By the end of the 1950's and into the 1960's, Arsuk would become one of the wealthiest fishing communities in Greenland, with some comparisons of its per capita income being compared to the oil fields in Kuwait, but the relationship with the mine site remained difficult, especially as the community began to shrink after the closure of the mine.

In stark contrast to the native sealing and fishing villages nearby, Ivittuut was a place completely out of the Greenlandic imaginary, establishing it as a fundamental piece to a colonial legacy many Greenlanders have never forgotten. This created an entirely separate and fragmented history of Ivittuut, a space where stories and cultures had existed but were completely reduced due to the economic influence of the extractive sector. To this day, the perspective of the Arsuk community and their story remains incomplete.

World War II production and US diplomatic involvement

Prior to World War II, US interest in Ivittuut was primarily a private sector concern with limited diplomatic activities. The US respected Denmark's sovereignty over the island and had no formal diplomatic presence there. However, there was growing American interest in Greenland's strategic and scientific value, particularly for meteorology and Arctic resource exploration. Cryolite supply routes had already been established in Philadelphia, Pennsylvania, to a company called Pennsylvania Salt Manufacturing Company or Pennsalt, where it was refined as a flux for alumina production. On April 9th, 1940, Nazi Germany occupied Denmark under Operation Weserübung, disconnecting Ivittuut from the European supply chain of equipment and logistical support from Denmark. Only one Danish ship, S/S Julius Thomsen, was out of port during the Nazi invasion and was able to maintain shipments (Secher, 2018). Kryolitselskabet Øresund A/S became concerned about the security risks, and through engagements with the Americans, agreed to hire off-duty US Coast Guard soldiers who would act as a private security force. Off-duty or "retired" personnel were hired to denounce any notions that the US was getting involved in the war. Their roles included patrolling the surrounding waters, transporting supplies, and supporting the defense of critical infrastructure. Small arms and a one 4-inch artillery gun were set up in the fjord to protect the site from potential German U-Boats and land attacks.

The US formally entered the war after the attacks on Pearl Harbor and by August 6th, 1941, troops had arrived in Greenland announced in the *New York Times* captioned "The Long Arm of US Defense Reaches Greenland" ([Agreement Relating to the Defense of Greenland, 1941](#); [Dathan, 2012](#)). The operation was conducted under the "Agreement Relating to the Defense of Greenland," signed on April 9, 1941. President Roosevelt later announced that Greenland would be included in the US continental defense zone, bringing it under the scope of Washington's Monroe Doctrine. The agreement between the US and the Danish government-in-exile (based in Washington, D.C.) was led by Cordell Hull, the current Secretary of State, and Henrik Kauffmann, representing as Danish Ambassador to the US. Military planning was led by General George C. Marshall and Rear Admiral Edward H. Smith led operations to monitor and protect Greenland's coasts from potential German infiltration, particularly through weather stations and potential submarine activity. While not formally called a "Defense Act," this executive agreement served as the legal and diplomatic basis for U.S. military presence in Greenland during World War II. It granted the U.S. the right to build and operate military bases on the island to prevent German encroachment and to protect vital North Atlantic routes. During this period, ore and shipments were directly sent from Greenland to Philadelphia and Port-Alfred in Quebec, Canada (Aluminum Company of Canada, commonly known as Alcan) for processing. However, this mineral diplomacy was part of a larger controversy, as Henrik Kauffmann was accused of acting independently after Denmark was occupied in 1940. Reports suggest that despite objections from the Danish government and Greenlandic governors, Kauffmann signed the treaty with the U.S., granting them base rights in exchange for aid and protection ([Lidegaard, 2003](#)). Kauffmann was also the managing director of Ivittuut due to quasi-state ownership and involvement, and he had a direct interest in protecting corporate interests during the middle of a war. A major point of contention was Article X, which gave the U.S. veto power over any future changes to the treaty—a clause that strained relations among the U.S., Denmark, and Greenland for decades. Greenland's strategic location and valuable cryolite resources made it crucial to American interests under the Monroe Doctrine. This diplomatic drama resurfaced when President Donald Trump expressed interest in buying Greenland, prompting a firm rejection from Greenland's leadership but reigniting debate about U.S.—Greenland relations. Kauffmann's bold and unauthorized diplomacy later inspired the 2020 film *The Good Traitor* in which this diplomatic controversy was explored.

By mid-summer of 1942, a camp was established behind Ivittuut, known as Bluie West 7 by the Army, with roughly 500 personnel. On the opposite side of the fjord was "Fort Nance," with an additional 300 personnel. In 1943, after the US entered the war, the US Navy began the development of Grønnedal, including the road construction between the military base and Ivittuut. At this time, the base and Ivittuut was home to roughly 500 US soldiers guarding the 100 to 200 miners and their families ([Berry, 2012](#)). Some of the kids living at the mine during this time would trade cryolite for goods, coins, and souvenirs with the US soldiers. Between 1940 and 1945, the Greenlandic government (known as the administration) maintained the title over Ivittuut. This change in administrative control did bring the mining community

of Ivittuut closer to the rest of Greenland, as slowly more and more locals began working in Ivittuut. Despite being out of the eye of the public and political discourse in Washington D.C., US control over Ivittuut was a significant show of supply chain power during wartime.

The amount of trade and ship traffic at Ivittuut during the war was the first major economic trade and international cooperation between Greenland and the outside world besides the Danish crown. During the war, the mining was managed by the mining company with the US focusing on security and controlling entry and exit to the Arsuk fjord. The Arsuk community had zero influence over the fate of the fjord, a place they had called home for many generations. By this time, an entirely separate culture, history and community, distinct from Arsuk, was beginning to develop. A place where Greenlandic and Danish heritage blurred, and colonial life was more of a reality than traditional economies and Greenlandic living.

Postwar studies suggest that the US built over 300,000 military aircraft during the war, a feat only capable due to a steady supply of cryolite (Parker, 2013). In 1945, at the end of the war, Denmark took over its 50 percent share of the company capital and with it effective control over its policies and decision making. The US released control of Ivittuut and the military base in 1951, 6 years after the end of World War II. By 1953, after Denmark redefined Greenland as a district of Denmark, things began to change regarding local community involvement. Ivittuut residents became taxed similarly to others in Greenland, which provided considerable tax revenue from liquor and tobacco. Danish miners and local hunters and fishermen were also able to vote in elections, one of which saw the appointment of a Greenland clergyman from Arsuk village for the municipality government. Danish troops would remain at the military base in Grønnedal for many more decades, a reminder of the securitization and militarization of the critical resource used by the Allied front during the war. Like the Danish, community members in Arsuk and Greenlandic society were not pleased with how the US operated Ivittuut during the war time. Interviews with Arsuk community members today, many of whom are descendants of mine workers, showed hesitancy and caution when discussing how the US treated local communities during the period (Lockhart, 2019; Heikkinen et al., 2020). When the US left the mine behind, they destroyed many of their former buildings at the site, leaving the cryolite mine behind, wiping its hands of social and environmental politics, a history long forgotten by many in America. The US did not use its time in Greenland to remain engaged in the mining development of the country, rather it backed away and disengaged in the country's natural resources development for many decades until recent geopolitical tensions with China and Arctic security developments.

End of an era

By 1962 the cryolite ore was officially “mined out.” The remaining years of the mine would be focused on procuring revenue from the large tailings piles. The company would begin reducing workers and dismantling the operation and by 1987, Kryolitselskabet Øresund A/S was dissolved. Due to industrial demand synthetic cryolite was eventually developed from fluorspar

(fluorite), removing the need for natural cryolite. With the mine closed, Ivittuut remained its own municipality due to the active military base at Grønnedal which was under the full control of the Arctic Command.

Two former Danish geologists decided to create a museum at the mine site in 2006. The site drew widespread attention and became one of the most popular museums in Greenland, but was closed in 2014. Since 2012, there have been multiple proposals and meetings within Arsuk and Greenlandic society of what should happen to the mine site. This coincides with the Danish military's decision to maintain control over the base in 2018, despite having only one to three personnel there at all times. Cruise companies continue to visit the site along with hunters, travelers, and local fishermen, but alternative uses outside mining and the military base remain in the periphery. Proposals for the use of the site's facilities have been discussed, ranging from a geotourism center, musk ox hunting encampment, a research station, an environmental college, a holiday hotel, but none of these visions have come to fruition. Jobs have been a primary focus for those in Arsuk, wanting a future where they can finally be a part of the future of Ivittuut. However, the Sermersooq municipality has not acted upon any of these proposals, despite outside and internal interest and potential investment.

In 2021, Eclipse Metals Limited, an Australian exploration company, entered into an agreement to acquire the Ivittuut Project in Greenland. Their proposal has focused on extracting the high-grade quartz left over in the cryolite pit and exploring the untapped and unexplored carbonatite deposit nearby the cryolite mine (Eclipse Metals, 2024a). In the years since, nothing new has come of the mine site besides the environmental impact assessments, musk ox hunting, and Ikka fjord research by European researchers. Eclipse has stated it does have an interest in pursuing the redevelopment of the mining museum as a community engagement project, but an article by Kommuneqarfik Sermersooq suggests the museum will be reopened in Paamiut in the coming years, guided by officials at the local museum in Nuuk. This settlement is to the north of Ivittuut and is not a destination for many tourists or cruise lines. The municipality hopes to draw people to the settlement to see the Ivittuut museum. The uncertainty of Ivittuut's future should not detract scholars from considering various geopolitical scenarios that incorporate social dynamics of decision making for the site's future development.

Mineral diplomacy and the Ivittuut cryolite mine

The history of the Ivittuut Cryolite Mine is a prime example of the power of minerals to transform geopolitical decision making and influence future political discussions around natural resource extraction. US-European diplomatic engagement in the Arsuk fjord was a defining feature of Allied strategic success during World War II and potentially a key reason for aluminum being a ubiquitous material across broader society today. Securing supply chains of key critical materials remains a cornerstone of modern geopolitical decision making, yet as Ivittuut highlights, it has often excluded local communities, de-emphasized alternative development trajectories in favor of more extractive and defense

related priorities, and been conducted by a small group of powerful state and corporate interests.

The revival of US interest in Greenland has resulted in more conflict rather than cooperation, with comments about taking over the island nation and the lack of Danish security financing making many people in Greenland and Denmark concerned about future cooperation. While national and maritime security has been used to justify this rhetoric, there is a continued emphasis on the subsurface resources as part of a negotiation and reason for engagement with Greenland. Since Kauffman's agreement with the US, the country has remained focused on the natural resources and strategic national interests rather than long-term engagement with Greenland's social and economic development.

However, as the Danes reconcile with past and current colonial legacies, the US has failed to reflect its mineral diplomacy with Denmark to accommodate these structural and political realities between the two countries. No longer can neo-imperial and corporate ambitions be used to define geopolitical actions in the Arctic, and with Greenland's rights over mineral policy and quest for independence, there is no political reality by which Greenland will give up its sovereignty to support mine development.

Instead, mineral diplomacy should be a process of critical reflection and acknowledgment around the political contours and power dynamics which shape natural resource extraction, and which fully recognizes the need to have all communities and indigenous voices represented when making these large mineral partnerships or deals. It should be a process which incorporates justice, indigenous sovereignty, and indigenous science as to provide a more clear and nuanced understanding of how not only states, but their citizens interact with the natural world which provides the resources from which society flows forth. Most importantly, it should recognize the political power of nature and the minerals and materials that make up modern society.

Mineral diplomacy must be a process that is inclusive of all the various stakeholders and is used to better understand different development visions and pathways for a given country or context. In the case of Greenland, mineral diplomacy should not be used as a leverage to wedge the Greenland and Danish relationship, rather it should be a recognition that minerals play a pivotal role for the interest of each state and therefore a negotiation around how to accommodate these futures should be made. It should not be about state or corporate interests, rather the interests of the people within the nations who negotiate and collaborate on supply chain development. Centralizing mineral diplomacy narratives around independence financing, supply chain security, and US-Chinese competition only obfuscates the complex and delicate history of colonialism which is still a fundamental part of the discussion and ongoing healing process today. It discounts the lived experiences and past legacies that have come from past US mineral activities in the region. The community of Arsuk, whose story is yet to be fully shared with the world, falls victim to these broader narratives that overlook the impacts, opportunities, and challenges around mineral development. Mineral diplomacy is therefore a building block for diplomatic engagement which recognizes the natural world and the subsurface as a relevant and important stakeholder in modern geopolitical discourse, and it

should be based in theories which acknowledge and address these dynamic issues.

Conclusion

This study demonstrates that mineral diplomacy is a fundamental process in which actors enact political will in an attempt to stabilize and achieve economic and national security priorities during periods of colonialism, conflict, or great power competition. As the US and China engage in trade disputes and the restructuring of global supply chains, mineral diplomacy, and mineral deals will become an ever increasing component of diplomatic engagement between states and their security priorities. The need to dissect and intellectually discuss the contours and narratives used by those involved in this process will be essential in protecting communities and ensuring large state-backed projects do not overstep indigenous sovereignty and future community interests.

This research contributes to the broader understanding of the role of minerals in state decision-making processes and how mineral diplomacy as a process requires further intellectual investigation to better understand how it has evolved over time and varying techniques states have used to support their mineral diplomacy efforts. Modern political commentary around Chinese mineral diplomacy, or "*Minerals for Infrastructure*" has been identified, yet further theoretical debate and discussion is encouraged. The US, as shown with the case of Ivittuut and modern political dialogue, seems focused on maintaining a military or defense focus with its mineral diplomacy, but this has remained a key concern within Greenlandic and Danish culture surrounding the histories of extraction and impacts on local communities since World War II.

Actors engaged in mineral diplomacy at the national and local levels should be transparent about the political role these minerals and materials play in reshaping extractive narratives and influencing geopolitical actions, especially in being clear about the impact and opinions of the communities which will be impacted both positively and potentially negatively from extractive development. By foundationalizing mineral diplomacy processes with frameworks of political geology and other social science theory, states have a better chance of increasing the long-term benefits for communities and increasing community support for mineral projects as part of a future in which all parties are involved, rather than some excluded. Critical minerals are not just a product of modern geopolitics, they are a fundamental part of state-building processes and power acquisition.

Future research is encouraged to analyze mineral diplomacy across various case studies and nation states to understand how various government approaches have been made. Theory on corporate social responsibility, social license to operate, and community consultation can support these efforts, but the authors recognize that this moment in time presents a new challenge as states seek to maintain more power over the subsurface whether due to supply chain vulnerabilities, resource nationalism, or energy transition material demands. Drawing on the fields around narrative making, justice, and the relationship between

international affairs and political science theories on natural resources will also benefit in this intellectual pursuit. Greenland sits at a very important moment in its history, with many long-term and culturally significant questions waiting to be answered, but as the Ivittuut Cryolite Mine showcases, mineral diplomacy must reflect deeper on the political and social dynamics in which it operates in and the colonial legacies which have defined extractive sector development globally.

Data availability statement

This paper is based on archival research which is publicly available. Interviews transcripts can be made available within the norms of identifying respondents upon their request and following appropriate procedures for protecting indigenous communities as per out approval from the IRB of the University of Delaware.

Author contributions

TH: Conceptualization, Formal analysis, Writing – original draft, Writing – review & editing. SA: Conceptualization, Supervision, Writing – original draft, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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