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The Rush for Greenlandic Metals

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Never before has the demand for metals been as high as it is now. Products and technologies we use every day, including smart phones, electric cars, wind turbines, cutlery and light bulbs are all constituted by metals, and demand is soaring. In spite of the ever-growing production, industrial and political actors are fearing resource scarcity (see figure 1).

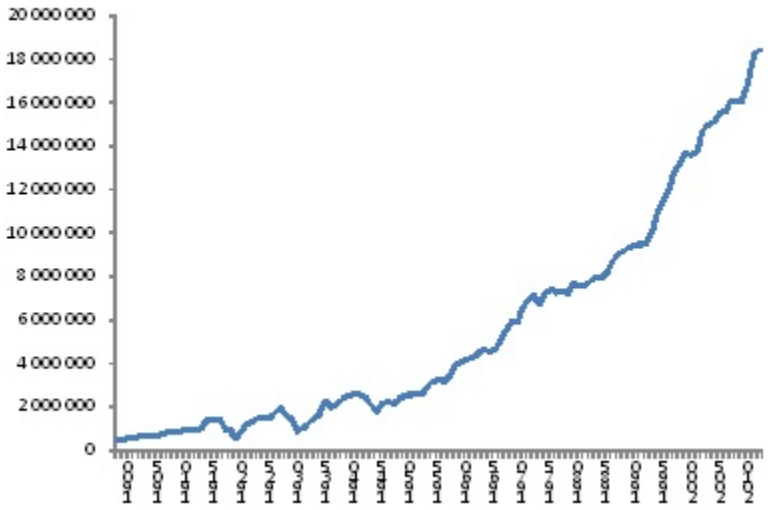

Figure 1. Global production of copper [ton], 1900-2014. Source: U.S. Geological Survey, "Copper statistics".

Historically, actors who perceive a shortage of a particular resource – be it mineral or agricultural – have often turned to the exploitation of regions perceived as "empty" and "unpopulated".[1] One of these places is the Arctic. The Arctic has been perceived as a future bonanza, one of the last frontiers left on the earth to explore. Oil

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[1] Edward Barbier, *Scarcity and Frontiers.*

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and gas companies have since the 1970s oil crisis turned to the Arctic's sea floor in hopes of finding vast deposits.[2] These recent booms are not the first time the Arctic has been the target for dreamers seeking treasure. The image of tough, manly individuals wresting treasure from a hostile environment spread to the Yukon and Alaska during the Klondike and Nome gold rushes of the late nineteenth century. But more organized efforts to find Arctic minerals also took place.[3] In 1903 an expedition set out to find rare metals in the Canadian Arctic, in hopes of discovering deposits containing osmium, used as a filament in metal filament bulbs.[4]

"The world was ransacked for osmium. Expeditions were sent out to explore wild territory, engineers being hired to go out with pack mules to traverse unknown country far away from places man had ever visited."[5]

Around 2010, Greenland began to figure prominently in media reports about the most recent Arctic boom (see figure 2). Many of these reports credit melting ice as the reason behind the most recent plans for mining in the area. Because of global climate change, the Island's minerals are, in their view, popping up, just waiting to be extracted. But is that really the reason that Greenlandic minerals have become so attractive? Geopolitical and commercial maneuvering to diversify and secure supplies and Greenland's own politics of autonomy and self-rule have more to do with the growing interest in mining than the notable recent changes in Greenland's ice cover.

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[2] Michael Klare, *The Race to What's Left*; Dag Avango and Per Högselius, "Under the Ice".

[3] Kathryn Morse, *The nature of gold: An environmental history of the Klondike gold rush.*

[4] Hanna Vikström*, The Struggle for the Perfect Glow.*

[5] John W. Howell and Henry Schroeder, *History of the Incandescent Lamp*, 90.

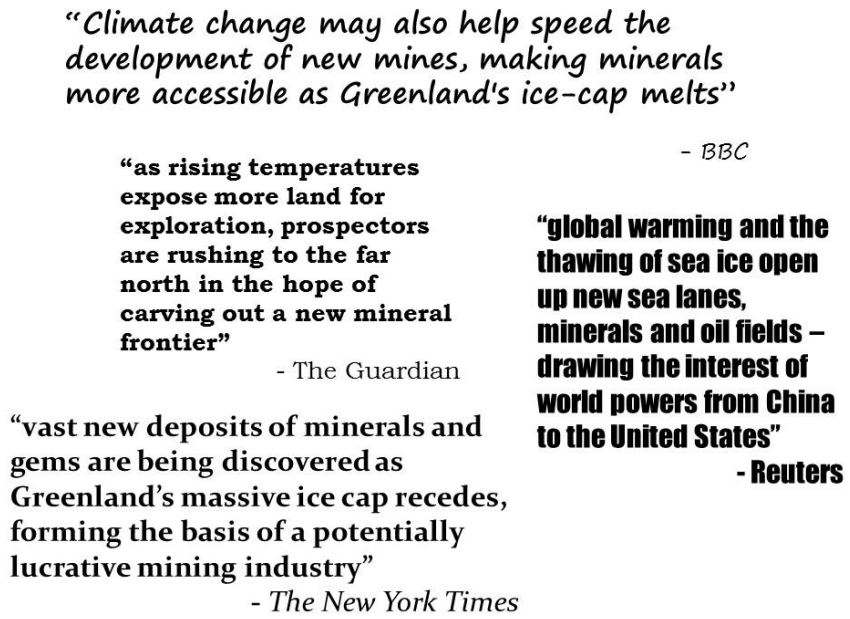

Figure 2. Media perceptions of Greenland as a future minerals hotspot. Source: Scrutton Alistar, "In vote, resource-rich Greenland debates new global role"; Terry Macalister, "Melting ice caps open up Arctic for 'white gold rush'"; Elisabeth Rosenthal, "A Melting Greenland Weighs Perils Against Potential"; James Fletcher. "Mining in Greenland - a country divided."

Twice I have had the opportunity to visit Greenland, and I, like so many others, was amazed by the natural beauty of its massive ice cap, crisp air, mountains and rugged coastlines. The good food and beautiful (if for many incomprehensible) language help explain why tourism is becoming an important industry. The 57,000 inhabitants live near or on the coastline, and almost one third are situated in the capital, Nuuk. Traveling from Nuuk to other towns is only possible using sea or air transportation, as the roads are limited to towns. Yet for all of this visitors might also become aware of anxieties, as happened for me when a colleague of mine very nearly landed in a bar fight because he was thought to be Danish. The fight dissipated almost as soon it began, fortunately, but the tensions that became evident that evening underscore the larger political concerns that inform much of Greenland's current worries over, and hopes for, metal extraction.

Figure 3. The harbor in Illullissat, August 2015, photo by Hanna Vikström

Greenland's history is of course tightly connected to Denmark, who officially colonized Greenland when the Danish missionary Hans Egede disembarked there in 1721. The Danes, in their view, protected the island, keeping its borders essentially closed until 1953. In that year Greenland become a recognized part of the state of Denmark rather than a colony, and Copenhagen began to pay more attention to the Island. Indigenous Greenlanders have become more politically active since this time. In 1979 they obtained Home Rule from Denmark, and in 2009, full self-government involving the transfer of all functions except defense and foreign affairs from Copenhagen to Nuuk. It took another thirty years before they got a greater degree of autonomy, self-government in 2009; then most political functions except for defense and foreign affairs were moved from Copenhagen to Nuuk.

Mining has long been important to Greenland, even before the rush of 2010. It has long been known that Greenland has a unique geology, and rests on deposits of rare metals and minerals, many of which are found and extracted in only a few sites around the world.[6] The largest and economically most important mine was located in

[6] Henry Nielsen and Henrik Knudsen, "Too hot to handle: The Controversial Hunt for Uranium in Greenland in the Early Cold War"; Frank Sejersen, *Efterforskning og udnyttelse af råstoffer i Grønland i historisk perspektiv,* 42f; Jørgen Taagholt and Hans. P. Steenfos and Taagholt, *Grønlands Teknologiehistoria*, 79.

the town of Ivittuut, in the southern part of Greenland, (see figure 4), where from 1854-1962 the Danish company *Kriolitmine Selskabet* (later *Kryolitselskabet Øresund*) extracted cryolite, a mineral crucial in the processing of aluminum, with exports continuing up until 1987.[7] Cryolite was almost exclusively extracted in Greenland; other countries depended completely on Greenlandic supplies. During the Second World War, a time when access to aluminum for the manufacturing of airplanes was vital, Americans took over the defense of Greenland, in large part it seems, because of the cryolite mine.[8] Other operations focused on copper, zinc and lead, coal, uranium, and marble. After 150 years however, many important mineral resources could no longer be profitably mined; in 1990, the Swedish Company Boliden closed down the only remaining mining operation, the lead-zinc mine Black Angel, situated in Maamorilik, due to depletion.[9] Suddenly, Greenland was a country without mining.

Figure 4. Selected mining sites in Greenland, 1780-1990

Greenland's government responded to this by pushing harder to promote new mining activities, hoping to strengthen the island's economy and decrease their economic dependence on the annual Danish block grant which represented the primary

[7] Hanna Vikström and Per Högselius, "From Cryolite to Critical Metals"; Frank Sejersen, *Efterforskning og udnyttelse af råstoffer i Grønland i historisk perspektiv*; Steenfos and Taagholt, *Grønlands Teknologiehistoria*, 75f.

[8] Steenfos and Taagholt, *Grønlands Teknologiehistoria*, 79.

[9] Steenfos and Taagholt, *Grønlands Teknologiehistoria*, 71f; Sejersen, *Efterforskning og udnyttelse af råstoffer i Grønland i historisk perspektiv;* Vikström and Högselius, "From Cryolite to Critical Metals".

basis of their national budget.[10] Mining, they hoped, would be pave the way for Greenlandic independence. To make this happen, they had to clarify who owned Greenland's minerals: Greenland itself, or Denmark? After a fierce debate, the Danish-Greenlandic Self-Rule Commission, determined that Greenlandic minerals belonged to Nuuk, not Copenhagen.[11] In 2010, Greenland took control of sub-surface resources through the Mineral Resources Act, allowing them to negotiate directly with interested companies.[12] There was no lack of interest as numerous companies had already undertaken prospecting activities.[13]

Figure 5. The mining settlement of Qullissat in summer 2015. Photo by Hanna Vikström

It has long been known that Greenland has a unique geology, and rests on deposits of rare metals and minerals, many of which are found and extracted in only a few sites around the world.[14] The EU, US, and numerous mining companies have first and foremost, perceived Greenland as a future Eldorado of rare earth elements

[10] Government of Greenland, *Greenland's oil and mineral strategy 2014-2018.*

[11] Mark Nuttall, "Self-rule in Greenland, towards the world's first independent inuit state?" Indigenous Affairs 3-4.

[12] Mark Nuttall, "The Isukasia iron ore mine controversy: Extractive industries and public consultation in Greenland".

[13] Vikström and Högselius, "From Cryolite to Critical Metals".

[14] Ibid.

(REEs).[15] A group of seventeen metals found together with the radioactive elements uranium and thorium. REEs are crucial in electronics, in hybrid cars, in magnets for certain wind turbines, but also for the manufacturing of computers and smart phones. REEs allow electronic devices to be small: a magnet made of neodymium, for example, can be made much smaller than magnets of other materials. Computer screens, televisions and smart phones also contain REEs. Growing demand for electronics, and the push for frequent product upgrades means that demand for REEs is soaring.

Apart from increasing demand though, fear of of supply disruptions has driven many countries to diversify their sources. China has for the past twenty years dominated the global REE market, providing almost the entire world with these elements (see figure 6). Although the US was up until 2002 a large producer, the mining company, Molycorp was forced to close their only mine, Mountain Pass, due both to declining prices, and repeated environmental accidents. In 2001 for example millions of cubic meters of radioactive wastewater leaked out into the surrounding valleys.[16] Now, there was no option but Chinese rare earths.

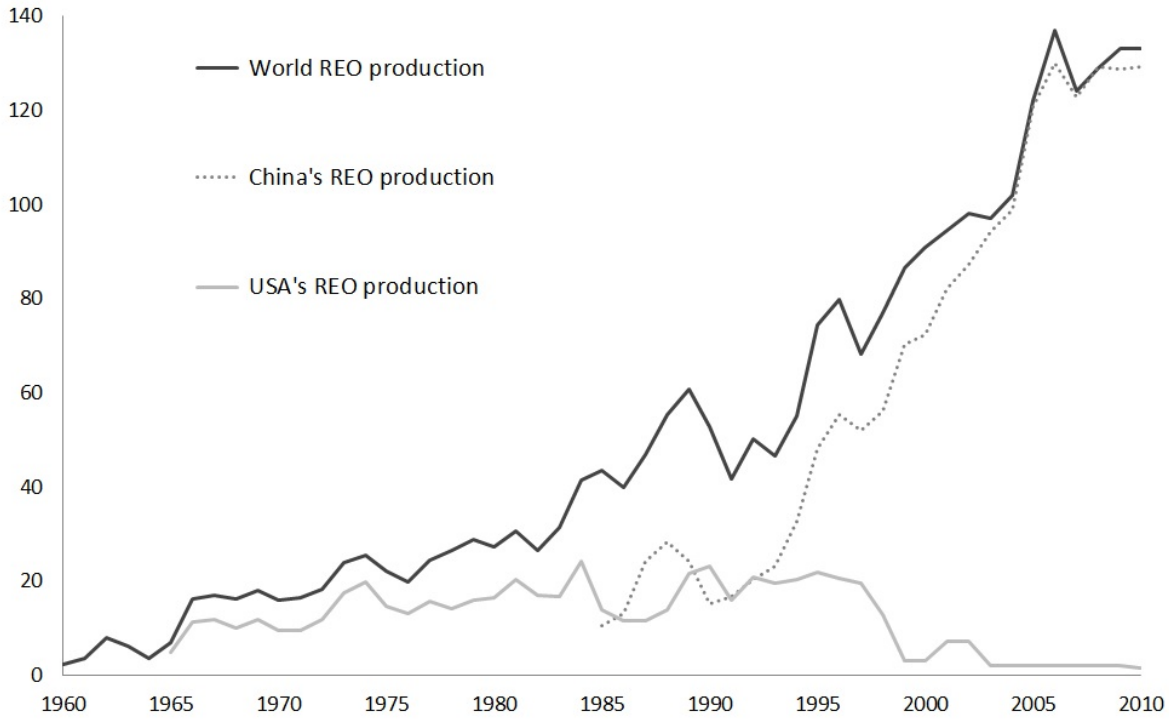

Figure 6. World Production of Rare Earth Oxides, 1960-2010 (Source: USGS, 2010)

Chinese production in the meantime grew almost exponentially (see figure 6), with much of the production originating in one mine, Bayan Obo in Inner Mongolia. Its

[15] Ibid.
[16] Hanna Vikström, *Rare Metals: Energy Security and Supply*

focus on keeping costs low came with a steep price to workers and the environment, as the BBC's Tim Maughan reported in 2015:

From where I'm standing, the city-sized Baogang Steel and Rare Earth complex dominates the horizon, its endless cooling towers and chimneys reaching up into grey, washed-out sky. Between it and me, stretching into the distance, lies an artificial lake filled with a black, barely-liquid, toxic sludge. Dozens of pipes line the shore, churning out a torrent of thick, black, chemical waste from the refineries that surround the lake. The smell of sulphur and the roar of the pipes invades my senses. It feels like hell on Earth.[17]

Some policymakers from other countries feared that Chinese dominance would leave them too dependent on these commercially valuable metals. Beijing had already proven that they might use it as an economic or political weapon when they stopped exports to Japan in 2010.[18] "A disruption of supply" would, claimed the Economist on January 20 2011, "paralyze the Japanese economy as much as an oil embargo or food blockade." Because Japan dominated the technical processing of rare earths, the rest of the world would be affected too.[19] The EU and US began to classify rare earths as the most strategic metals in the world, and accordingly, they sought to diversify the supply.[20]

As multiple global players slowly began to start up or restart REE extraction, Greenland caught the attention especially of the EU, as a supplier both politically reliable and geographically close.[21] Against this background, Greenland has emerged as a great alternative, a politically reliable supplier geographically close to the EU. Even before the EU's strong interest, mining companies were eyeing Greenland's minerals.[22] In 2007, coincident with a sharp upward trend in rare earth prices that made more deposits economically viable, an Australian mining company, Greenland Minerals and Energy, received a prospecting license to explore minerals in the Kvanefjeld area, with a promising REE deposit conveniently located close to an ice-free fjord.[23]

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[17] Tim Maughan, "The dystopian lake filled with the World's tech-lust." 2 April 2015.

[18] Klare, *The Race to What's Left.*

[19] The Economist. "Corporate Japan adjusts quickly to a shortage of rare earths".

[20] BGS, "Risk List"; DOE, "Critical materials strategy".

[21] U.S Geological Survey, "Rare Earths"; EU, "Critical raw materials for the EU"; EU "Greenland's raw materials potential and the EU strategic needs". Greenland was even part of the EU, joining it together with Denmark in 1979 but left it in 1983 after a referendum.

[22] Henry Nielsen and Henrik Knudsen. *Uranbjerget*, 243f.

[23] Greenland Minerals and Energy, 2017; Lill Rastad Bjørst, "Saving or destroying the local community? Conflicting spatial storylines in the Greenlandic debate

Figure 7. The location of some recent exploration projects in Gereenland

But the road to transforming Greenland's mining was not yet clear. The problem was uranium. Since 1988, Greenland has had a zero-tolerance policy for uranium mining, originating in Denmark's decision not to pursue nuclear power. Because REEs occur together with uranium, mining companies would have to extract uranium in order to also extract the rare earths. Greenland Minerals and Energy obtained permission to

on uranium"; Another Australian company, Tanbreez, eyed a REE deposit at Kriglerne, close by.

explore the deposit, and confirmed that it could indeed become a large-scale mine.[24] The Greenlandic government had to address the question: should they abandon the uranium ban and scale up extraction of rare earths? Or retain the ban and give up the mines?

Mining these crucial metals could fulfill the politicians' dream of a more economically independent Greenland. How to weigh this against the environmental consequences of mining? The government put the question to a vote. With the Greenlandic push for autonomy, mining in Greenland had become mining for Greenland, a potential benefit for all of Greenlandic society.[25] Yet Greenlanders were torn over the issue. Mining could potentially give locals a chance to work, easing high unemployment. However, others argued, mining could destroy the pristine environment and hinder growing tourism. Demonstrations and campaigns against mining were visible during my visit to Nuuk in mid-October 2013, Stickers and posters saying "urani naamik" (no to uranium) were on cars, bus stops, and billboards, and came in different sizes and shapes (see figure 8). Yet this was certainly no easy decision. Ultimately, on October 24 2013, the Greenlandic government voted in favour (15-14) of abandoning the ban.[26] Their decision followed precisely their long-term goal to promote mining as a path to a more independent Greenland.

[24] More on the ban and why it was not as strict can be found in Henry Nielsen and Henrik Knudsen. Uranbjerget; Nuttall, "Self-rule in Greenland, towards the world's first independent inuit state?".

[25] Rastad Bjørst, "Saving or destroying the local community? Conflicting spatial storylines in the Greenlandic debate on uranium"

[26] Mark Nuttall, "Zero-tolerance, uranium and Greenland's mining future".

Figure 8. A billboard in Nuuk with a note on a demonstration on “I am saying no to uranium mining”. Photo by Hanna Vikström.

Yet even now, all obstacles to mining have not been removed. Denmark retains control over Greenland’s strategic radioactive materials, and therefore the debate regarding access to Greenland’s minerals continues.[27] As of 2017 it is unclear whether the mining companies will pursue REEs in the region. Since about 2011, the global supply has diversified slightly, but to manufacturers and the EU, for instance, the fear that REEs will be controlled by a single power remains vivid. Interest and hopes for Greenland remain high.

While much remains clouded, one thing is clear. The melting ice is not the reason why mining companies are rushing to Greenland. While it does bring more attention to Greenland’s minerals, political relationships and market shifts are far more relevant. The Greenlandic government wants to exploit their country’s minerals, using Greenland’s mining history as an argument, and the EU is eager to import Greenlandic metals for its own quite different (geo)political reasons. Geopolitics, together with increasing metal prices and soaring demand for rare earths in contemporary technologies are what really make Greenland’s metals so alluring.

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[27] Read more on this topic in Nielsen and Knudsen, *Uranbjerget*

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