



# We Need to Talk About Mining in the Arctic

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The Arctic encompasses a myriad of ecosystems, transcending borders between nations and cultures. It is home to 4 million people, including numerous Indigenous groups making up around 10% of the population. Although underexplored, it is also host to a variety of geologically diverse mineral deposits that are critical to the production of renewable energy and our ability to achieve our climate goals. However, the impact of climate change on the Arctic is magnified and some of our solutions to climate change have the potential to have negative local impacts. Furthermore, the history of mining in the Arctic raises understandable concerns as to whether or not we should be exploring and mining in the Arctic. This article discusses the interplay between the environment, people and development in the Arctic, with a specific focus on the history of exploration and mining in the region. We pose questions such as: “How do we balance the global need for minerals with environmental and social concerns around resource extraction?”, and “can we envisage a future for mining in the Arctic which ensures long-term sustainability, environmental stewardship and Indigenous wellbeing and collaboration?” The answer to some of these questions might lie in examples of more successful resource development in the Arctic, which include Indigenous benefit agreements, braided knowledge systems and shared ownership projects. It is clear that only by incorporating a diversity of voices and partnerships, and challenging business as usual in the Arctic, can we begin to conceive of potential solutions for achieving a just transition.

**Keywords:** sustainability, climate change, critical minerals, just transition, Arctic, mining, environment, indigenous peoples

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## INTRODUCTION

The snow- and ice-covered mountains of Lofoten in Norway provided a truly dramatic and breathtaking backdrop to the workshop on the “Green Shift” in the Arctic, part of the 2023 Arctic Frontiers conference. Sat here amidst the local communities, the fisheries and the stunning mountain scenery, the two authors of this paper met, alongside 32 young and emerging leaders from different walks of life and industries across the Arctic. The combined knowledge of our group covered a wide range of perspectives and personal experiences gained through living in the Arctic, Indigenous knowledge, and knowledge specific to an Arctic-based industry including fisheries, renewables and many more. In the workshop we found that our diverse group shared a common vision for the Arctic, one of creating a sustainable north, where voices and decisions of the North are from the North and planetary and human welfare are at the forefront of our actions.

Minerals are an important part of our future, particularly in the transition to an economy driven by renewable energy, where the supply of critical raw materials may influence our ability to produce renewable energy and fulfil our climate goals. The rise in demand for critical metals is driving exploration and mining globally. The historical, and in some places current, record of mining has led to distrust among many stakeholders, including Indigenous and other communities in the Arctic, resulting in the mining industry being the least trusted industrial sector globally, below oil and gas (Dhawan, 2023; data from GlobeScan). To meet our climate goals, we not only need to open more mines to supply the critical raw materials we need, but we have to do this in an environmentally and socially responsible way.

Throughout the week, we embraced taboo topics such as mining and realised very quickly that the more we talked about mining, the less taboo it became. Mining is fundamentally an unsustainable process as the resources we remove from the ground are not replaced, and the lifecycle of a mine is finite. So, how can we balance our global need for minerals with environmental and social concerns surrounding resource extraction?

We discussed questions such as these and, in the context of our shared vision, talked about where the solutions might stem from. It was these motivating discussions that prompted us to explore different examples of mining and exploration in the Arctic, historical and current, to see what lessons can be learnt. What has remained clear throughout, is that environmental, social and governance factors go hand in hand with sustainability and the green transition and must therefore be a crucial part of any new mining operation.

## ARCTIC PEOPLES AND ENVIRONMENT

The Arctic is considered to host some of the most extreme and challenging environments on Earth and is often depicted as a land of ice, polar bears, and northern lights. This polar environment has continually inspired and challenged exploration, perhaps dating as far back as 325 BCE when the ancient Greek sailor, Pytheas, reached a frozen sea while attempting to find the source of the metal tin (Simpson-Housley, 1996). In the present-day world, exploration of the Arctic has not decreased since Pytheas' time and instead, the Arctic is a region which encounters significant research, exploration and resource extraction.

There is an ever-increasing global need for resource extraction, enforced by a worldwide commitment to increase technological production, reduce emissions and to move to greener forms of energy (United Nations Environment Programme, 2024). For example, approximately 84% of the periodic table's 83 stable (nonradioactive) elements are included in a mobile phone (ACS Chemistry for Life, 2024). In 2021, 61% of the world's population owned a mobile phone and the number of mobile devices was growing at a rate of 5 times faster than the number of people (MobiCode, 2021). Whilst the need for resource extraction, and the reification of

this need, is becoming increasingly apparent, there are significant consequences of this industry. Environmental, social and political impacts of increasing resource extraction in the Arctic are having a direct impact on Indigenous, local and Arctic communities. These issues are incredibly important and must not be muted in the shadow of the energy transition.

Approximately 4 million people inhabit the Arctic and the region occupies an area of >33 million km<sup>2</sup>, spanning 8 countries (Murray et al., 1998). The Arctic is home to over 40 different Indigenous groups including Sámi, Aleut, Inuit, and Yupik communities who are spread across Northern Europe, North America, Russia and Greenland (WWF Arctic, 2023). Indigenous people make up around 10% of the population of the Arctic, 53% in the Northern Territories of Canada, 92% in Greenland, 76% in the Norwegian Arctic, 46% in the Swedish Arctic, 46% in the Finnish Arctic and 9% in the Russian Arctic (Young and Bjerregaard, 2019 and references therein). This northern land encompasses a myriad of natural environments and ecosystems transcending borders between nations and cultures.

Throughout its history, the Arctic peoples and land have been continuously impacted by European trade, capitalism and extractive industries through the process of colonisation, as well as global systems which continue to shape the developments in this complex region (Greenberg, 2009). The history of resource extraction in the Arctic is by no means clear-cut: these industries have undoubtedly shaped the environmental and political identity of the Arctic, whilst consecutively exerting influence over Indigenous and local communities, affecting their ability to uphold their Indigenous culture and way of life. Many of these pressures came from the increasing environmental, social and economic impact of different industries (Zentner et al., 2019; Fohringer et al., 2021; Hanaček et al., 2022).

The united global goal, to reduce greenhouse gas emissions and to transition to greener energy forms, directly impacts Indigenous communities in the Arctic. Currently, the Just Green Transition is dependent upon mineral extraction, extraction that often takes place on Indigenous land in the name of the "Green New Deal" (Robbins and Zografos, 2020). This has been termed "Green Colonialism," the phrase was first used by Aili Keskitalo, the former president of the Sámi Parliament in Norway, to describe the impact of extractive industries and energy development projects on Indigenous land (Normann, 2022, pg. 13; Saami-Council, 2017). Whilst there are undoubtedly detrimental consequences of mining in the Arctic, with many of these impacts being deemed acts of "Green Colonialism" it is remiss to not acknowledge the multifaceted benefits of this resource extraction. Whether or not impacts are positive or negative can vary depending on the scale or perspective of the problem. We therefore present specific examples from different regions of the Arctic below.

## SOCIAL MOVEMENTS AND LEGISLATION

Throughout the Arctic, Indigenous and local communities have had their right to self-determination continually thwarted and

challenged by a myriad of industries and developmental projects in the region. The sentiment behind “Green Colonialism,” the purposeful sacrificing of Indigenous land in the name of environmental goals, has led to the creation of domestic and international agreements with the aim of protecting and preserving Indigenous land, culture and identity. Development of land claim settlements, such as the Alaska Native Land Claim Settlement in 1971, the largest Indigenous land settlement in US history, have positively contributed to Impact and Benefit Agreements between Indigenous peoples and mines in Alaska and elsewhere.

Whilst the mining sector is an industry known to have a direct impact on Indigenous communities in the Arctic, the impacts of development in the Arctic come from a wider array of industries including but not limited to resource extraction, exploitation of other natural resources (hunting, fishing), tourism, transport and energy infrastructure. These impacts have led to the development of a variety of frameworks and legislation which have been previously affected by lack of recognition of the rights of Indigenous peoples to land, mineral and natural resources.

One example of this is The United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) which was adopted in 2007 and establishes a universal framework of minimum standards for the survival, dignity and wellbeing of Indigenous Peoples worldwide (United Nations, 2015). UNDRIP stipulates that Indigenous Peoples are not solely stakeholders in potential extractive projects but instead, they are right holders. The ratification of UNDRIP led to change throughout the Arctic. For example, in Greenland, the 30 year old “Greenland Home Rule Arrangement” was replaced in 2009 by the Act on Greenland Self Government. This provided the legal basis for Greenland gaining authority, previously held by Denmark, in matters exclusively related to Greenlandic domestic affairs and natural resources (International Energy Agency, 2023). Furthermore, in 2011, the Government of Sweden added a reform to the Constitution, stipulating that the Government shall encourage opportunities for the Sámi people and for other ethnic, linguistic and religious minorities in Sweden to preserve and develop their own culture and community life (Human Rights Council Report, 2014).

An integral part of UNDRIP is the notion of Free, Prior and Informed Consent (FPIC) which stipulates that states must have obtained free, prior and informed consent before adopting and implementing legislative or administrative measures which impact Indigenous Peoples. The recognition and promotion of the Free Prior Informed Consent is an important principle of engaging with Indigenous peoples during mining projects and has become very important worldwide. The International Finance Corporation, a member of the World Bank, has created eight performance standards which aim to provide guidance on how to avoid, mitigate and manage risks so that business is conducted in a sustainable way (International Finance Corporation, 2012a). These standards recognise that Indigenous Peoples may be particularly vulnerable to the adverse impacts associated

with project development, including the loss of identity, culture, and natural resource-based livelihoods (International Finance Corporation, 2012b). The implementation of FPIC has also been seen in the mining industry. In 2013, the International Council on Mining and Metals (ICMM) published a position statement on the rights of Indigenous peoples incorporating FPIC principles and promoting constructive relationships between mining companies and Indigenous peoples. ICMM noted the increase in acknowledgement and application of FPIC in the mining industry since the Mining, Minerals and Sustainable Development (MMSD) initiative was completed, 12 years ago.

In addition to the protections provided by UNDRIP and FPIC, the International Labour Organisation Convention formed the Indigenous and Tribal Peoples Convention in 1989, which is often referred to as ILO No. 169, recognising Indigenous Peoples’ right to self-determination and paving the way for the creation and implementation of UNDRIP. A previous ILO convention, No. 107 formed in 1957, was created in the wake of WW2 amidst rising concern regarding the oppression and discrimination of Indigenous Peoples. Norway declined to sign this convention in 1958, noting that the provisions included did not apply to the Sámi (Ravna, 2020) but became the first to ratify ILO No. 169 in 1989. As one of the signatory states, Norway is obliged to recognise Sámi self-determination and within this is the restitution of Sámi culture and heritage. An example of this is the Bååstede project which has seen around 1,600 Sámi cultural heritage artefacts from the Norwegian Folk Museum and the Museum of Cultural History in Oslo, being returned to six Sámi museum siidas. Furthermore, the National Archives of Norway handed over the Lapp Codicil which is an addendum to the Stromstad Treaty of 1751 which defined the Norwegian-Swedish border, to the Sámi Archives, located in Kautokeino in 2021. This addendum to the border treaty contains provisions on the right of reindeer-herding between the Swedish and Norwegian border (The Library of Congress, 2021).

Whilst the ILO No. 169 has been ratified by 23 states, there are many countries where it has not been ratified. Canada is a non-signatory of the convention, this position is due to the state’s belief that the international community is unable to enforce these international instruments. In Canada’s Arctic, the dominant discourse between Indigenous Peoples and the settler society is framed in domestic terms, primarily domestic policy, instead of in terms of international law (Bankes, 2009).

## Norway

Norway has registered an obligation, under the 2015 Paris Agreement, that the country will reduce their emissions by a minimum of 50%, by 2030 (Ministry of Transport, 2023). Roughly half of the emissions in Norway come from road traffic, thus a significant reduction in this sector is required. To reach this goal, Norway has stipulated that by 2025, all new cars sold in Norway must be zero-emission vehicles: either electric or hydrogen (Ministry of Transport, 2023). Whilst this is a step towards combating climate change, the desire to

increase the production of electric cars has a cost, both in Norway and on a global scale. The consequences of this development are often shouldered by Indigenous and local communities who are located in the rural regions where resource extraction occurs.

The adverse effects of resource extraction are evident in the Norwegian case of the Nussir AS copper mine, in Repparfjorden, located in Sápmi, which has been a focal point of domestic and global debates surrounding the sacrificing of Indigenous land in the name of the 'Green Shift.' Additionally, the development of Nussir's copper mine affects the seasonal reindeer migration routes which cross the areas occupied by the mine (Tsiouvalas, 2020). The tailings from this mine also have the potential to negatively impact the marine environment and coastal Sámi communities (Tsiouvalas, 2020). Whilst Nussir have claimed that the environmental recovery of Repparfjorden will take between 2 and 5 years, Terje van der Meeren, a scientist at Norway's Independent Institute for Marine Research, has explained that it would take almost 300 years until completely unaffected marine life returns to the area (Simpson, 2021).

## Canada

In 2016, Canada's signing of the Paris Agreement committed the country to reducing its greenhouse gas emissions by 30% below 2005 levels, by 2030; this was enhanced in 2021 as Canada committed to increase this target to between 40% and 45% (Government of Canada, 2021). To meet the obligations set by the Paris Agreement, Canada has developed the Pan-Canadian Framework on Clean Growth and Climate Change, which is a 10-year program designed to fund environmentally friendly efforts from the mining industry to ensure a resilient sustainable value chain (International Energy Agency, 2022). This program, developed in consultation with Indigenous Peoples, is heavily investing in clean energy solutions with the aim of advancing the priorities of Indigenous Peoples, as well as northern and remote communities to transition away from diesel (Government of Canada, 2016).

An example of the impact of the Pan-Canadian Framework on Clean Growth and Climate Change program can be seen in the First Nation community in Coville Lake, located 50 km north of the Arctic Circle, in the Northwest Territories. There are approximately 160 residents in Colville Lake whose livelihoods were reliant upon privately-owned diesel generators, installed in the 1990s. In May 2016, a unique solar/battery/diesel hybrid system was developed which, between 2017 and 2018, saw a greater than 27% decrease in the operation of diesel generators (Electricity Canada, 2018).

The development of mining projects in remote, and often Indigenous regions, can have an impact on the traditional economic livelihoods of communities in addition to potential environmental impacts of mine development which are also significant. This has been seen in the Yukon, through the Faro Mining Complex which was once the world's largest open-pit lead-zinc mine. The large volume of tailings and waste rock, as well as the absence of environmental rehabilitation post-

mine closure, has led to the surrounding rivers of the Ross River and Liard First Nations being severely impacted (Belik, 2013). Even with remediation processes, the tailings from mining operations have the potential to contaminate local waterways, through erosion, acid drainage and the mobilisation of heavy metals (Leyton-Flor and Sangha, 2024). These consequences directly impact local and Indigenous communities whose fishery livelihoods and access to clean water are placed in jeopardy (Leyton-Flor and Sangha, 2024).

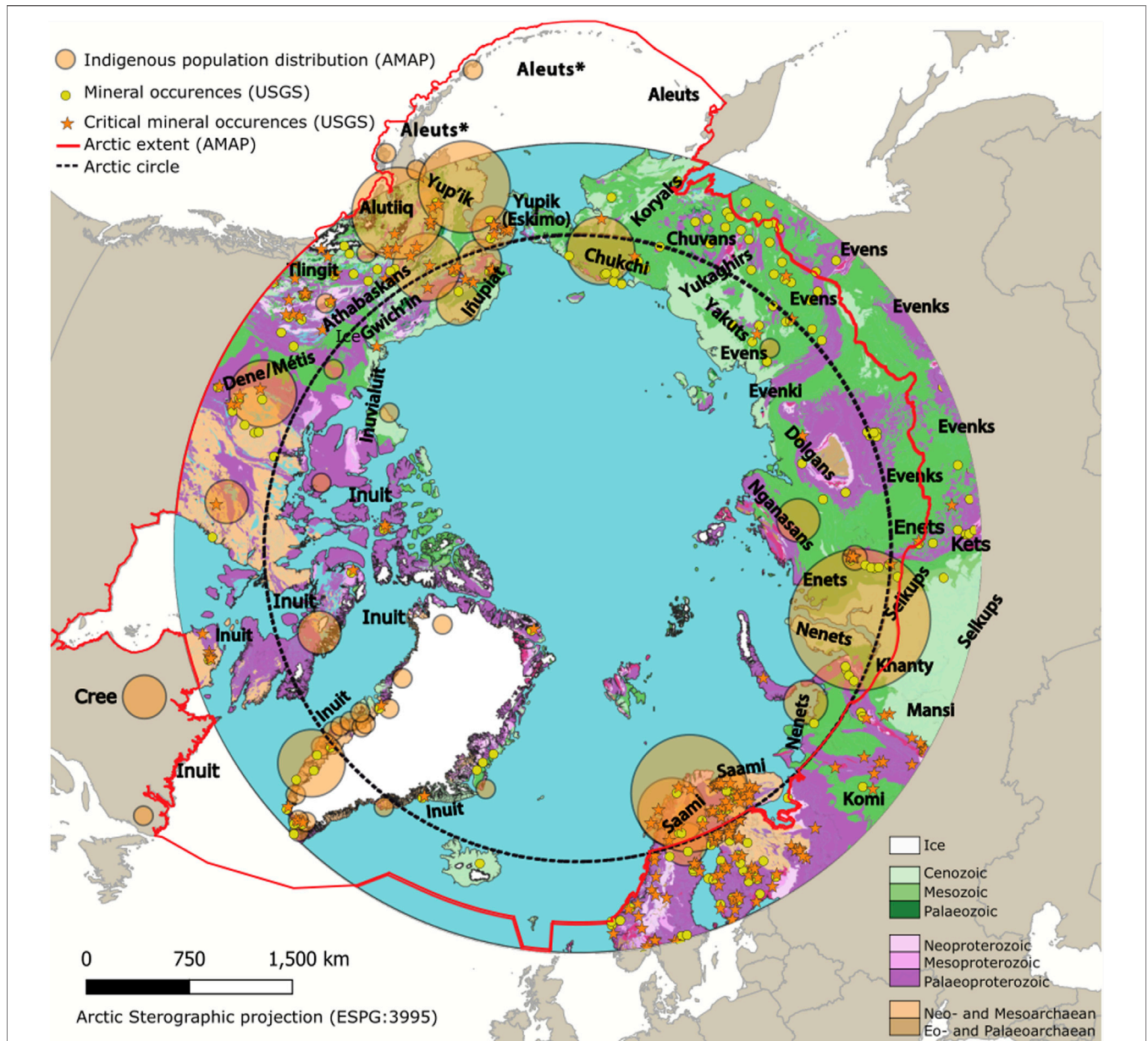
In contrast to the environmental disaster of Faro, the growing demand for metals (Schandl et al., 2016), and the projected continuation of this expansion (Arndt et al., 2017), has increased the need for workers in this sector. The mining industry has become increasingly dependent upon hiring locally and within communities whose homes are located near the project. There has been an incline in Indigenous members employed in the mining workforce, this has both countered labour scarcity and promoted social acceptability whilst also providing training and skill development locally, thus there are mutual benefits to this increase in the workforce (Brereton and Parmenter, 2008; Caron et al., 2019; Parmenter and Trigger, 2018; Pearson and Daff, 2013; Thiessen, 2016).

## EXPLORATION IN THE ARCTIC

The Arctic has a long history of natural resource extraction – indeed, these industries are often a major presence in remote regions. For example, the Dutch and British established whaling stations and coal operations on Svalbard in 1610, cryolite extraction began in Greenland in 1854 and the Klondike gold rush of Alaska and Yukon began in 1898 (Boyd et al., 2016). Oil and gas exploitation has also been and continues to be a major industry in the Arctic, although largely offshore, bringing in large amounts of revenue and resulting in significant environmental and social conflicts (Nuttall, 2010). This article, however, is primarily focused on the potential for critical mineral resources onshore.

### The Geological Significance of the Arctic

The Arctic is a region of geopolitical importance and of increasing interest to policymakers and exploration companies regarding its critical mineral potential. Whilst the US is "working to ensure access to critical minerals and infrastructure" (United States Department of Energy, 2022), the UK "encourages all countries to adopt the highest standards of Environment and Social Governance" (United Kingdom Foreign Commonwealth and Development Office, 2023) regarding successful mining of the Arctic. Whereas Canada, a country with 40% of its territory in the Arctic, has an Arctic framework which focuses on sustainable development of the northern regions and is particularly encouraging Indigenous ownership, investment, and participation in the resource industry as essential to success and reconciliation of these northern regions (Government of Canada Northern Affairs, 2017).



**FIGURE 1** | Arctic polar stereographic projection (ESPG: 3995) showing the geology of the Arctic, modified from Harrison et al. (2011), Department of Natural Resources Canada. Arctic circle denoted as a black dashed line. Extent of the Arctic, as defined by AMAP (2017), denoted by red line. Indigenous population distribution (orange circles) adapted from Crump et al. (2016) with data from AMAP (<https://www.amap.no/>). Location of mineral occurrences (yellow dots and orange stars) accessed from <https://mrdata.usgs.gov/major-deposits/> and compiled by Schulz and Briskey (2005) and references therein.

The Arctic is host to a huge diversity of mineral deposits and geological environments including Archaean to Proterozoic greenstone belts, Proterozoic to Mesozoic large igneous provinces and large sedimentary basins of multiple ages (Harrison and St-Onge, 2023; **Figure 1**). The Arctic is also host to a range of critical metals such as Ni, Zn, REEs and Cu which are essential for renewable technologies, such as wind turbines and solar panels (Boyd et al., 2016). There are numerous world-class deposits found in the Arctic which have

produced significant amounts of raw materials including Red Dog Zn-Pb mine in northern Alaska and Norilsk Ni-Pd mine in Russia. The Kiruna Mine, located in northern Sweden, is one of the world's largest underground iron-ore mines. Similarly, Raglan mine in the Nunavik region of Quebec is a large nickel mining complex dating back to 1931. Despite these known occurrences of minerals, large parts of the Arctic are relatively underexplored, introducing significant potential for additional resources to be discovered.

## CLIMATE CHANGE AND THE ARCTIC PARADOX

Traditionally, barriers to exploration in the Arctic have included significant cover by glacial deposits, sediments, permafrost, and ice, as well as barriers to access such as extensive sea ice, large areas and harsh environments. For example, the search for the north-east passage began in the 16th Century but was not traversed until the late 19th Century owing to the extensive ice cover. Today, barriers such as lack of infrastructure, lack of data and high cost of exploration are still significant. Despite this, there have been tremendous efforts to expand our knowledge of the Arctic resulting in examples such as small-scale geological maps (e.g., Harrison et al., 2011; Behnia et al., 2013; Petrov and Smelror, 2015; Petrov et al., 2021).

The Arctic is experiencing the impact of climate change much faster than other parts of the world. Whilst warming climates expand access to navigation opportunities and untapped mineral resources, they at the same time bring lasting impacts on the wellbeing of its people and the environment. Additionally, resource extraction, including raw materials for low carbon technology, has the potential to disrupt the social, cultural, and ecological wellbeing in project-affected areas (Larsen and Ingimundarson, 2023). This is the Arctic paradox, where our need for solutions to combat climate change have the potential to have negative impacts on the people and environments most affected.

Although mining has the potential to have negative effects on the local environment and people, it can also bring positive effects and opportunities, such as infrastructure and jobs, to these remote regions; development which is often looked on favourably, and even in some cases invited by local communities (Langston, 2021). Mining is therefore inexorably linked to sustainable development, touching on all 17 of the UN's sustainable development goals (Monteiro et al., 2019). Arctic peoples have traditionally protected the environment, maintaining and enhancing the environment for future generations (Ahtuanguak, 2018). Socio-environmental conflicts, primarily involving extractive industries and infrastructure development, often overlap with Indigenous peoples' territories (Hanaček et al., 2022). Arctic residents are therefore seeking to have a bigger say when it comes to Arctic decision-making, incorporating the rich knowledge of local environments and a long history of interaction with mining and industrial development.

## SUSTAINABILITY IN MINING

Looking to the future of mining in the Arctic: can this industry provide an opportunity for sustainable development and reconciliation? Sustainable development has been defined as "development which meets the needs of the present without compromising the ability of future generations to

meet their own needs" (Brundtland Commission, 1987). Whilst sustainable mining may be an oxymoron, sustainability in mining leading to the development of sustainable outcomes, is a legitimate concept that we should be working towards. Sustainability within the mining industry can be multifaceted, encompassing projects which aim to not only reduce the environmental and social impacts of mining through stewardship of the natural environment but to also add value, creating something sustainable in the long term. Sustainable goals must also include the development of, and continued effort towards, building long-term relationships with communities who are impacted by the mining process. Ensuring that mining is sustainable is not just reliant upon ethical extraction but also protecting the long value chain that occurs after the mining has taken place. This process creates environmental, social, and economic value which can positively benefit the local communities.

For example, despite being built on environmental disaster, Faro mine in Canada is now home to the Faro Mine Remediation Project, a government and Indigenous-led program. This program provides employment and training opportunities for Kaska and other Indigenous citizens (FARO Mine Remediation Project, 2022) and is an example of a long-term project which provides opportunities for locals whilst at the same time rehabilitating the environment. Incorporating sustainability principles into the lifecycle of a mining operation and beyond, has the potential to have a positive impact on communities and, if incorporated into the early planning stages, could contribute to the long-term sustainability of the local area.

These questions are also particularly pertinent in Greenland, a country with 92% Indigenous population, a great potential for mineral resources, a large expanse of unexplored land and a limited history of resource development (In 2020 there were 2 active mines in Greenland compared to 1001 in Canada). Despite the small number of mines in Greenland, some areas (such as in South Greenland) have been mined for more than a century and a significant proportion of the population of Greenland have some experience of exploration and mining operations and are positive towards mining (e.g., Agneman, 2018; Thaarup et al., 2020). As Greenland continues to be explored, coastal regions are becoming more and more prospective, and the number of exploration licences is slowly increasing.

The government and people of Greenland are currently battling with questions of environmental, economic, and political opportunities. For example, the controversial Kvanefjeld rare earth deposit is one of the most significant rare earth deposits globally and presents an opportunity for Greenland to become an internationally significant supplier of raw materials and perhaps establish economic independence from Denmark. Many local residents support the project as it offers greater employment whereas other have raised concerns about disruptions to the environment and the lack of adequate information, particularly surrounding the potential radioactive pollution, and failure to consult and seek local community's free, prior and informed consent (FPIC)

(Orellana et al., 2021). It should be noted, however, that the main concerns around the Kvanefjeld deposit are related to the presence of uranium in the ore. This is not reflective of the “typical” concerns to other exploration and mining operations elsewhere in Greenland, many of which are seen largely positively. A recent report on sand mining in Greenland surveyed almost 1,000 Greenlanders (>1.5% of the population) and found that large majorities support extraction but oppose foreign involvement (Bendixen et al., 2022).

## Examples of Indigenous Collaboration and Ownership

A direct result of oil and gas extraction throughout the Arctic has seen the increase in co-management structures between Indigenous communities and developers. The legacy of oil and gas extraction in Canada has led to a historical relationship of distrust between Indigenous communities and extractive industries. The oil and gas industry in Canada had a significant impact on Indigenous communities through the ever-increasing wave of Europeans arriving to be a part of the extractive industries’ growth (Alberta’s Energy Heritage). The 1850s in Canada saw a dramatic increase in the production of oil, with the Mining and Manufacturing Company of 1854 being the first dedicated oil company in North America (Alberta’s Energy Heritage). Furthermore, projects developing access and acquisition of gas, such as Coastal GasLink in British Columbia, have been accused of violating FPIC principles, thus continuing the challenges navigating these forms of extractivism and the Indigenous right to self-determination (StandEarth, 2022).

Whilst mining and Indigenous relations are typically portrayed in a negative light, there are examples, particularly in the Canadian Arctic, which can inform future exploration and mining. Red Dog mine in Alaska is a major world producer of Zn and Pb and is co-owned by Teck Alaska and the NAANA Indigenous corporation, providing an example where typical approaches to western business deals were challenged, resulting in a potential new approach to business in the Arctic. Raglan mine in northern Quebec is another example of a major world producer of Ni and the location of Canada’s first Impact Benefit Agreement with Indigenous communities, promoting political, social, and economic development of the region. Indigenous knowledge, in collaboration with two neighbouring Inuit communities, was incorporated into the environmental impact assessments prior to the Raglan mine operation, resulting in a shortened shipping season to aid conservation relating to Arctic char and seal populations (Natural Resources Canada, 2007).

Indigenous collaboration and ownership is increasingly common in Arctic development. For example, First Nations, Métis, and Inuit entities were partners or beneficiaries in nearly 20% of Canada’s existing electricity-generating infrastructure in 2022 (Gall et al., 2022), most of which produces renewable

energy, reducing reliance on diesel generators in these remote regions. The Nechalacho rare earth project, located on the traditional lands of several Métis and Dene First Nations groups in the Northwest Territories, involves a 51% joint venture ownership by the Yellowknives Dene First Nations, who will control mining operations at the site. This project provides significant potential for Indigenous and northern employment and economic benefit and is the first example of a First Nations business entity contracting for a mine operation on traditional lands in Canada.

Prior to the formation of international instruments, such as UNDRIP, FPIC and ILO No. 169, the decisions and legislation made in the Arctic mining sector were widely done so by corporations with very little to no Indigenous involvement in the decision-making processes. In 2018 the BC Regional Mining Alliance (BCRMA) was developed, an industry-led strategic partnership between Indigenous groups, industry and provincial government, that focuses on bringing investment through collaborative partnerships. The Golden Triangle region in British Columbia has been a hotspot for mineral and geological exploration for the last 150 years and investments and developments made by BCRMA has ensured that this region is becoming increasingly accessible (BCRMA, 2023).

Additionally, in 2021, Suncor Energy announced an unprecedented step forwards in terms of Indigenous and industry collaborations. They announced a new partnership with eight Indigenous communities in Wood Buffalo, this partnership allows the eight Indigenous communities to acquire all of TC Energy’s 15% equity interest in the Northern Courier Pipeline Limited Partnership (Foulis, 2021). This partnership is a reification of reconciliation attempts and exemplifies the wanted change from communities, within extractive sectors.

## Examples of Indigenous/Community Led Initiatives

Since the introduction of international instruments such as UNDRIP, FPIC and the ILO Convention No. 169, there has been an increase in Indigenous-led initiatives. Many of these have been focused specifically on the green transition. Securing Indigenous Peoples’ Rights in the Green Economy (SIRGE coalition) is one example of an Indigenous-led initiative. This coalition is led by an Indigenous Steering Committee which is made up of two representatives of Indigenous Peoples from each of the seven socio-cultural regions across the globe. SIRGE implements transformative solutions to secure the rights of Indigenous Peoples in the global transition to a green economy. This organisation has recently released a guide for Indigenous leaders to develop FPIC protocols and to implement these to ensure self-determination is reified for all Indigenous community members.

Another example of Indigenous communities heading initiatives within the extractive sector is in Alberta where the Frog Lake First Nations and the Kehewin Cree Nation are proposing an Indigenous-led carbon capture and storage

(CCS) hub located on their traditional territory. Whilst these communities are partnered with Kanata Clean Power and Climate Technologies Corp. and Vault 44.01 Ltd., it is expected that the Indigenous majority ownership share will be opened to other Treaty Six First Nations as the development progresses (Jaremko, 2023).

## CONSIDERATIONS FOR FUTURE EXPLORATION AND MINING IN THE ARCTIC

Industries, such as the extractive industries, have a long history in the Arctic which is intertwined with the development of social movements and legislation in the region. In parallel to these movements, we are also in the midst of the green transition which, if not managed correctly, could have unintended consequences for local communities and the environment.

The motivation for this article came from the inspiring conversations between a diverse group of young and open-minded emerging leaders from across or working in the Arctic who share a common vision of creating a sustainable north, where voices and decisions of the North are from the North and planetary and human welfare are at the forefront of our actions. These conversations highlighted that the topic of mining is not as taboo as originally assumed, but instead, is a part of our history and a part of our future. However, it is up to us to reimagine the future of mining and how, and if, this might form a part of the future of the Arctic.

This article does not attempt to find a single solution when it comes to the future of mining in the Arctic. In fact, many of our examples draw upon solutions from a wide range of groups such as Indigenous communities, government organisations, legislation, as well as the mining industry itself. In acknowledgement of the inherent interconnectedness of mining and the UN's sustainable development goals, we aim to encourage conversations about mining in the Arctic, such that a variety of voices can be heard. We have focussed on providing a range of examples of mining and exploration in the Arctic that have the potential to bring about positive benefits to local communities and the environment. These examples include the involvement of multiple different voices, particularly in the early stages of a project, and led to design and implementation that braided indigenous knowledge or ownership. What all of these examples have in common is initially a conversation, something that underpins FPIC and provides culturally and community specific solutions.

We hope that showcasing more positive examples of mining in the Arctic will bring about more constructive conversations that help to reimagine mining. We hope that by sharing these stories we can promote learning and collaborations which will positively impact the future of the Arctic.

## CONCLUSION

Mining is a major industry in the Arctic with huge potential to bring about a sustainable and just transition. But perhaps

the potential that these projects can bring to the Arctic and the positive examples that we can learn from need to be better communicated and realised in the context of mining. We are at a critical moment in time and, to achieve this vision, we must incorporate a diversity of voices, be open to stepping away from "business as usual" and develop a new practice for mining in the Arctic. As noted previously, there are many positive examples of co-management schemes, braided knowledge systems and shared ownership of projects throughout the Arctic and circumpolar North. Sustainability must reach beyond a solely environmental focus and encourage the development of collaborative relationships and benefit sharing. By talking about this more, we can not only help engage more people in the conversation but also in the solutions for bringing about a Just Transition. After all, what happens in the Arctic does not stay in the Arctic.

## DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

## AUTHOR CONTRIBUTIONS

Writing was conducted by AB and JH. All authors contributed to the article and approved the submitted version.

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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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